US007416310B1

(12) **United States Patent**
Savicki, Jr.

(10) **Patent No.: US 7,416,310 B1**
(45) **Date of Patent: Aug. 26, 2008**

(54) **POWER CONTROL DEVICE FOR AN ELECTRICAL LOAD**

(75) Inventor: **Gerald R. Savicki, Jr.**, Canastota, NY (US)

(73) Assignee: **Pass & Seymour, Inc.**, Syracuse, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/343,101**

(22) Filed: **Jan. 30, 2006**

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/726,173, filed on Dec. 2, 2003, now Pat. No. 7,213,932.

(51) **Int. Cl.**
F21V 33/00 (2006.01)
H01H 9/00 (2006.01)

(52) **U.S. Cl.** **362/95**; 200/317

(58) **Field of Classification Search** 362/85, 362/95, 800, 373; 200/330, 331, 18, 310, 200/313, 317; 439/490
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,329,678	A *	5/1982	Hatfield	340/310.12
4,485,282	A *	11/1984	Lee	200/51 R
4,880,950	A	11/1989	Carson et al.	
4,924,349	A *	5/1990	Buehler et al.	361/643
4,939,383	A	7/1990	Tucker et al.	
5,191,971	A *	3/1993	Hakkarainen et al.	200/550
5,262,678	A *	11/1993	Flowers et al.	307/125
5,359,231	A	10/1994	Flowers et al.	
5,637,930	A *	6/1997	Rowen et al.	307/112
6,005,308	A	12/1999	Bryde et al.	
6,061,261	A *	5/2000	Chen et al.	363/146
6,259,351	B1 *	7/2001	Radosavljevic et al.	338/176
6,294,874	B1 *	9/2001	Rudolph et al.	315/158
6,648,496	B1 *	11/2003	Elghoroury et al.	362/555

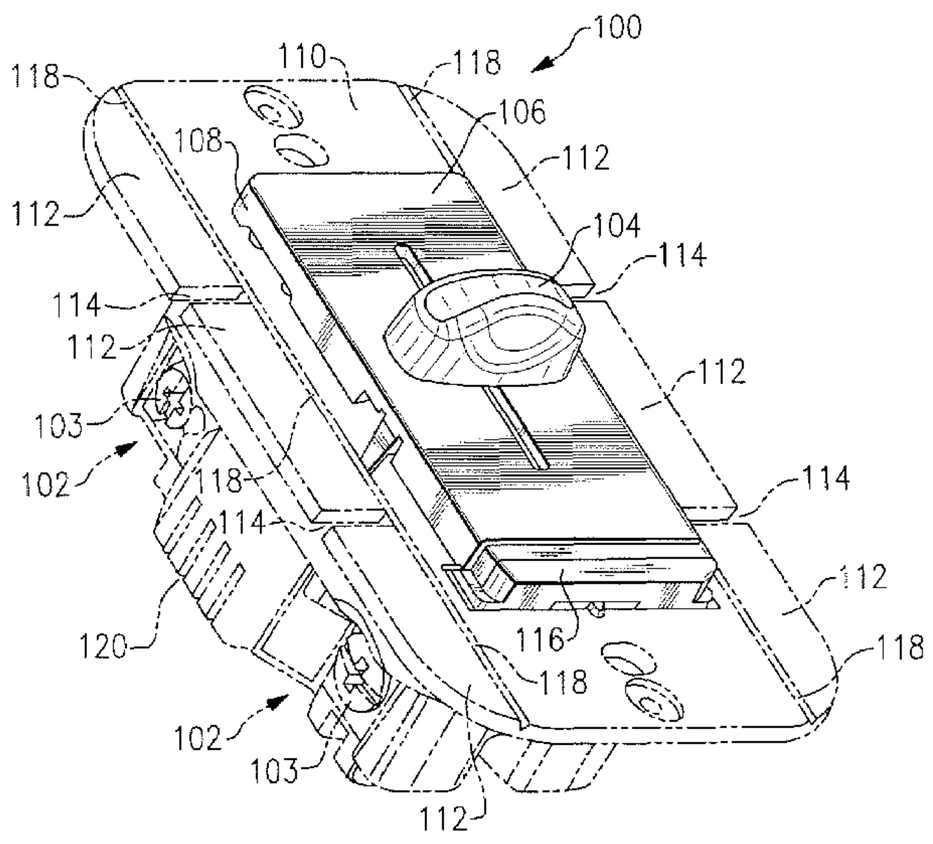
* cited by examiner

Primary Examiner—Stephen F. Husar
Assistant Examiner—Peggy A. Neils
(74) *Attorney, Agent, or Firm*—Daniel P. Malley; Bond, Schoeneck & King, PLLC

(57) **ABSTRACT**

The present invention is directed to a device for adjustably providing power to at least one electrical load. The device includes a body member. A plurality of terminals are configured to be coupled to a source of the power. A power control circuit is disposed in the body member and coupled between the plurality of terminals and the at least one electrical load. The power control circuit includes at least one variable control mechanism coupled to at least one series pass element. The at least one series pass element is configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting. A frameless front cover member is connected to the body member and has a raised rectangular form factor substantially corresponding to a standard wall plate opening. The frameless front cover assembly has a plurality of switch mechanisms including at least one first switch mechanism coupled to the at least one variable control mechanism and at least one second switch mechanism actuatable without interference from the standard wall plate. The at least one first switch mechanism and the at least one second switch mechanism are characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening.

39 Claims, 12 Drawing Sheets



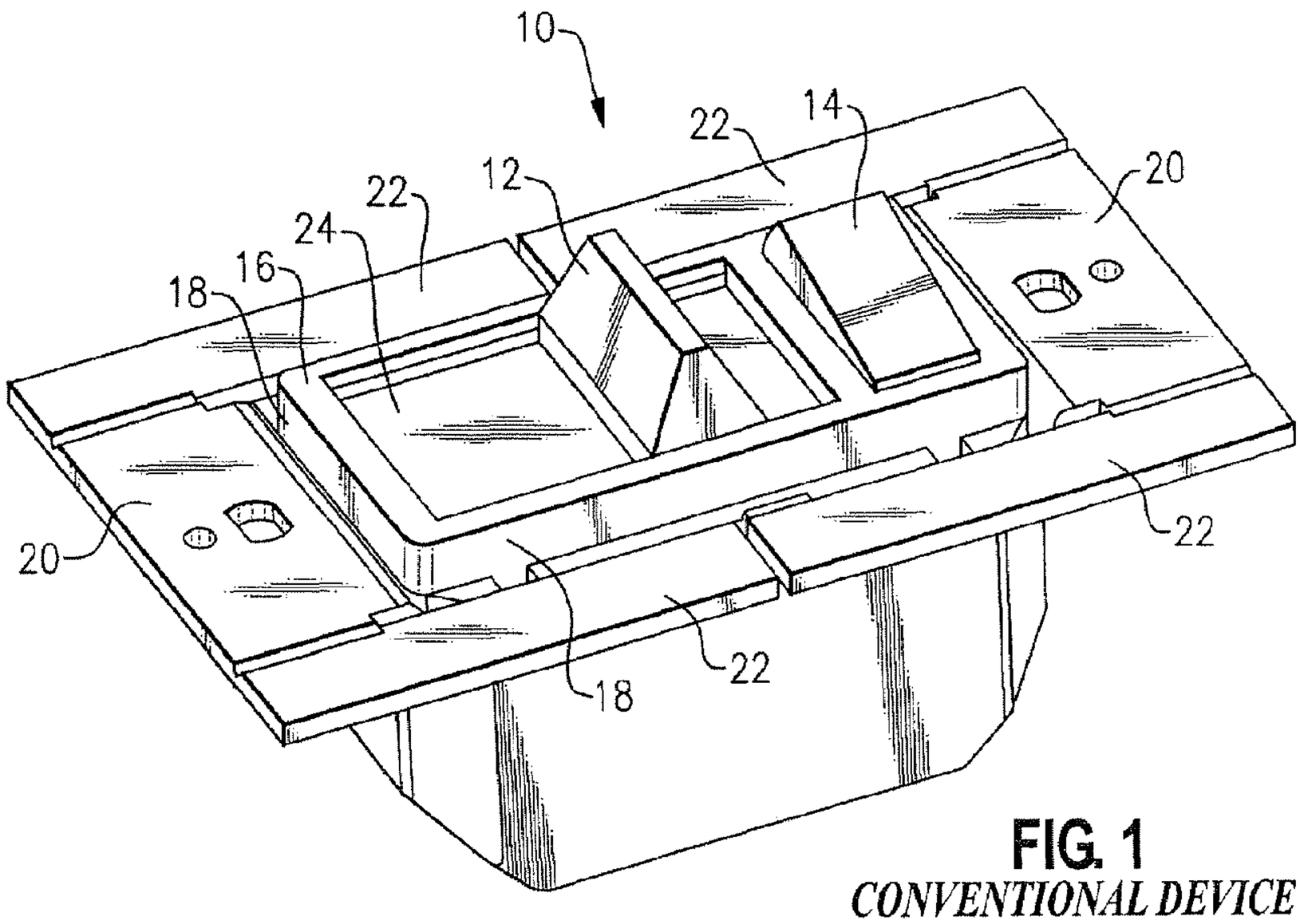


FIG. 1
CONVENTIONAL DEVICE

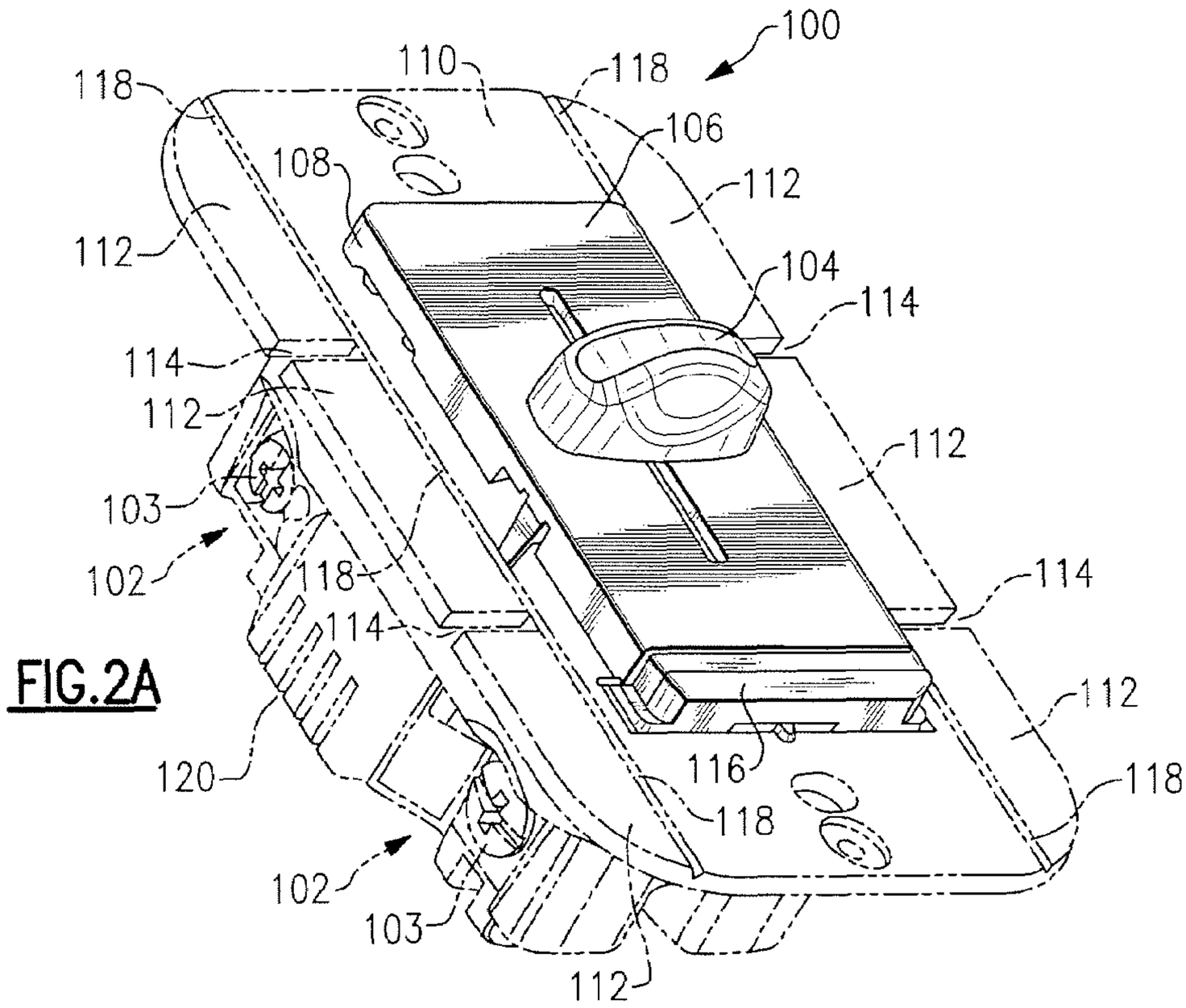

100
110
118
118
106
108
112
112
104
114
114
112
112
103
102
118
114
114
112
116
120
118
118
102
103
112

FIG.2A

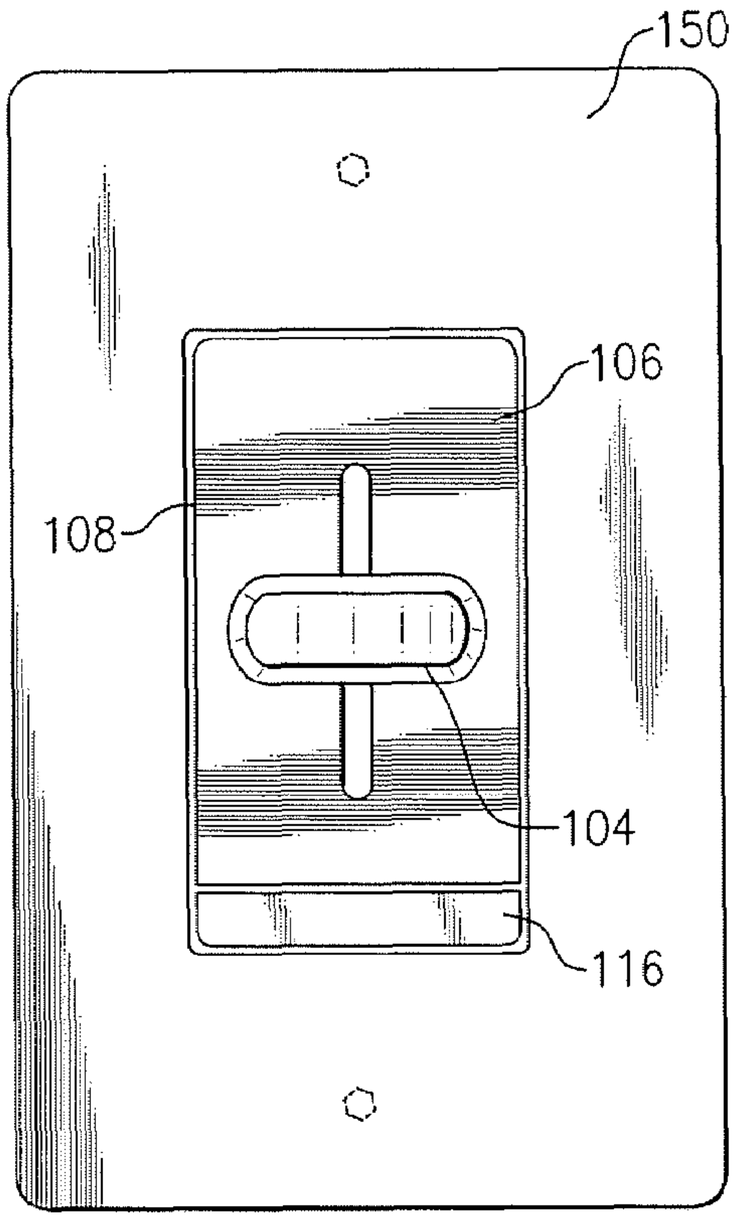

150
106
108
104
116

FIG.2B

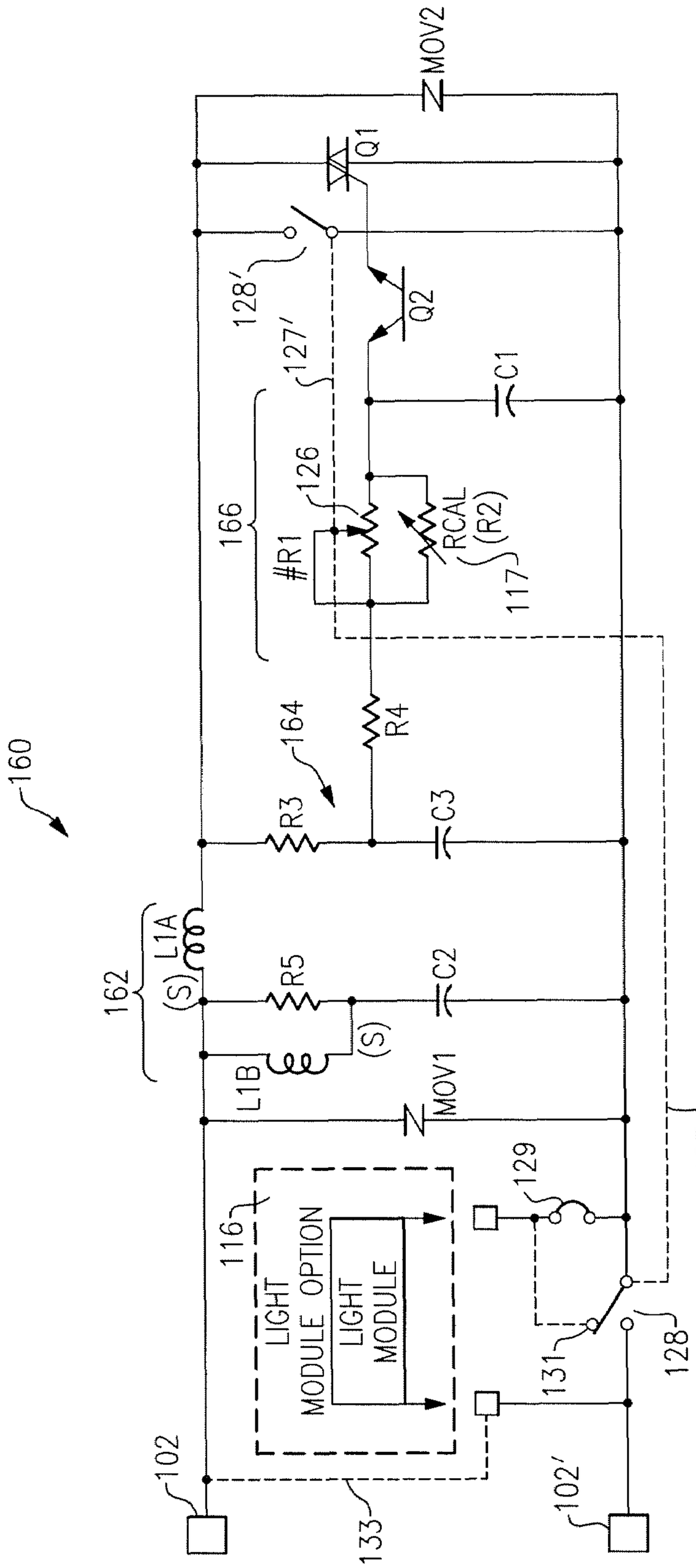

160
MOV2
Q1
128'
127'
Q2
C1
126
166
#R1
RCAL
(R2)
117
164
R4
R3
C3
162
(S) L1A
R5
C2
(S)
L1B
MOV1
129
127
116
LIGHT
MODULE OPTION
LIGHT
MODULE
131
128
102
133
102'

FIG.3

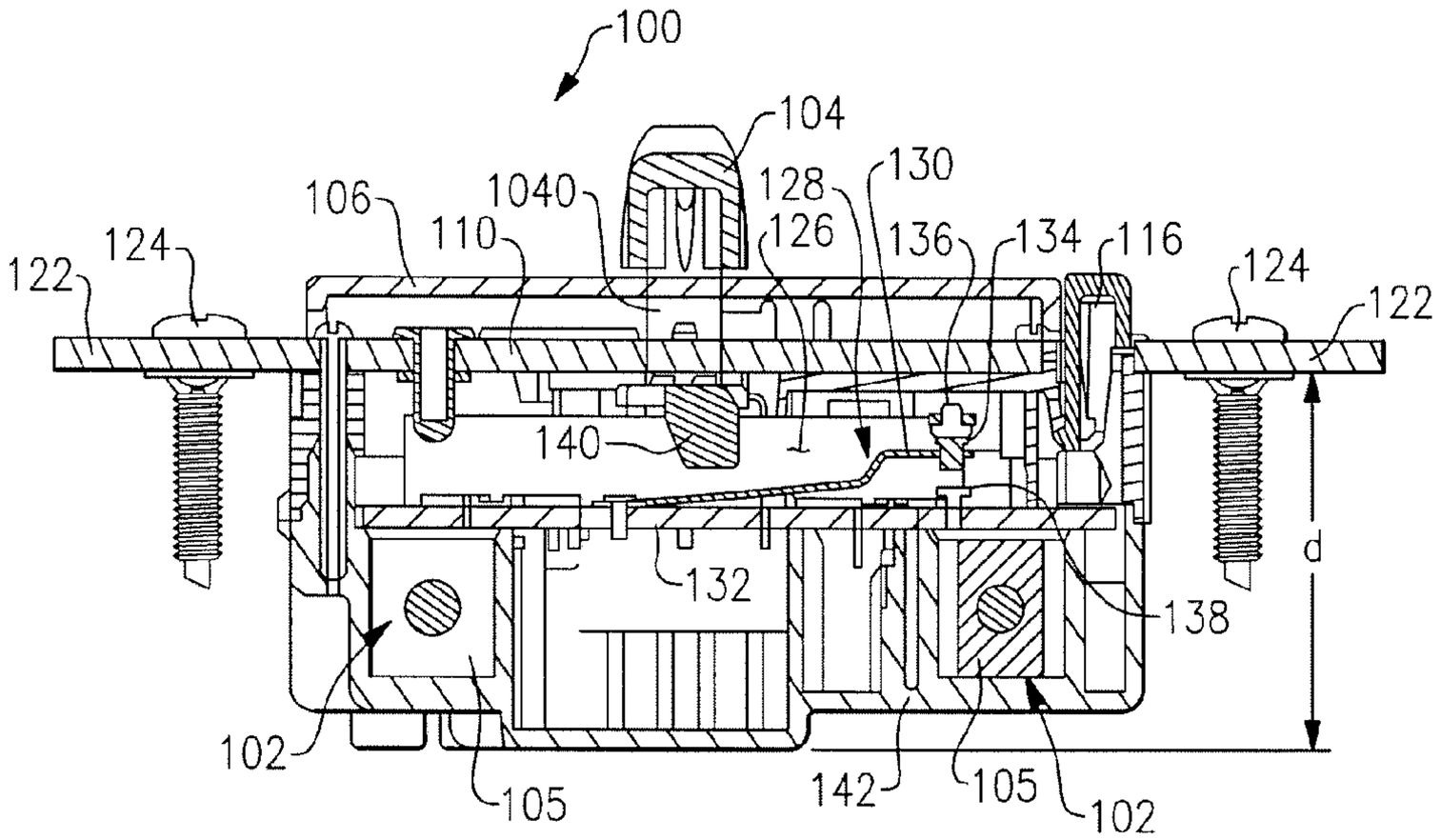

100
104
106
1040
128
130
110
126
136
134
116
124
122
124
122
140
132
138
d
102
105
142
105
102

FIG.4

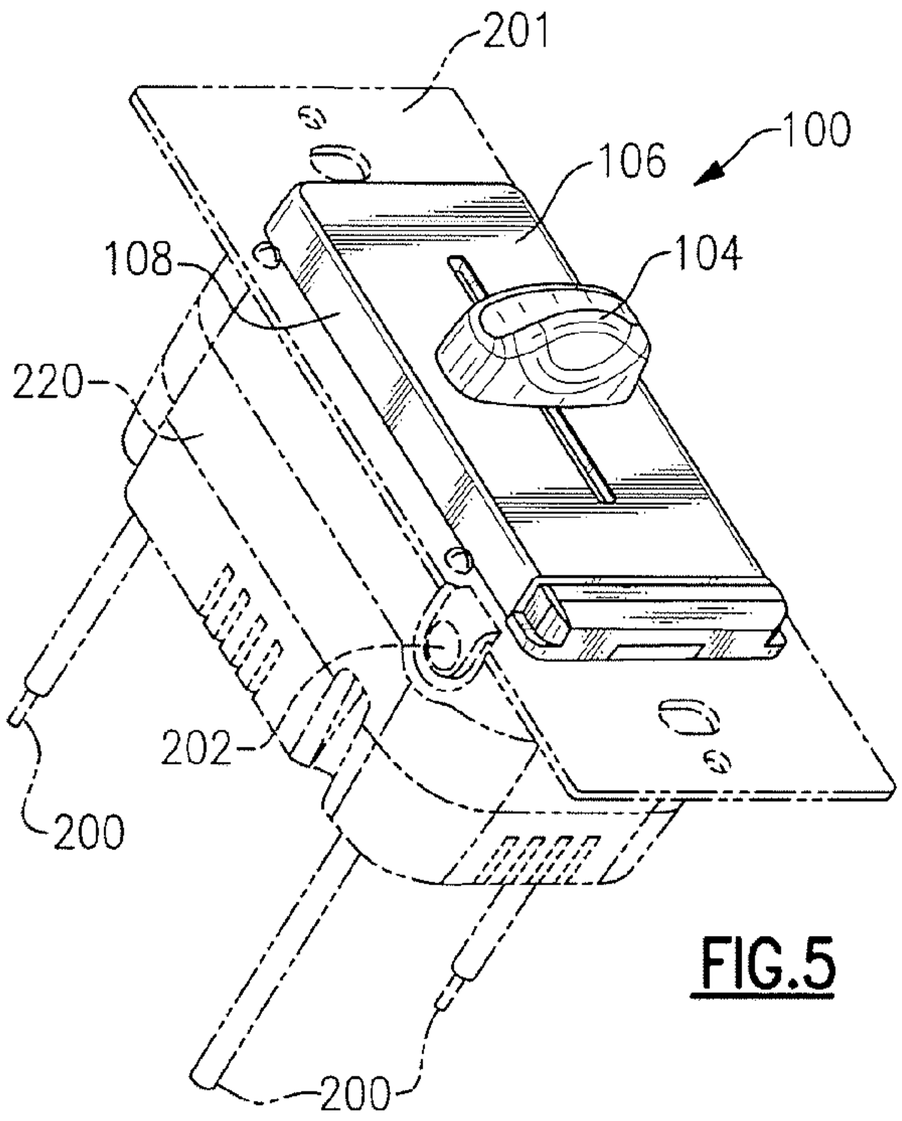

201
100
106
108
104
220
202
200
200

FIG.5

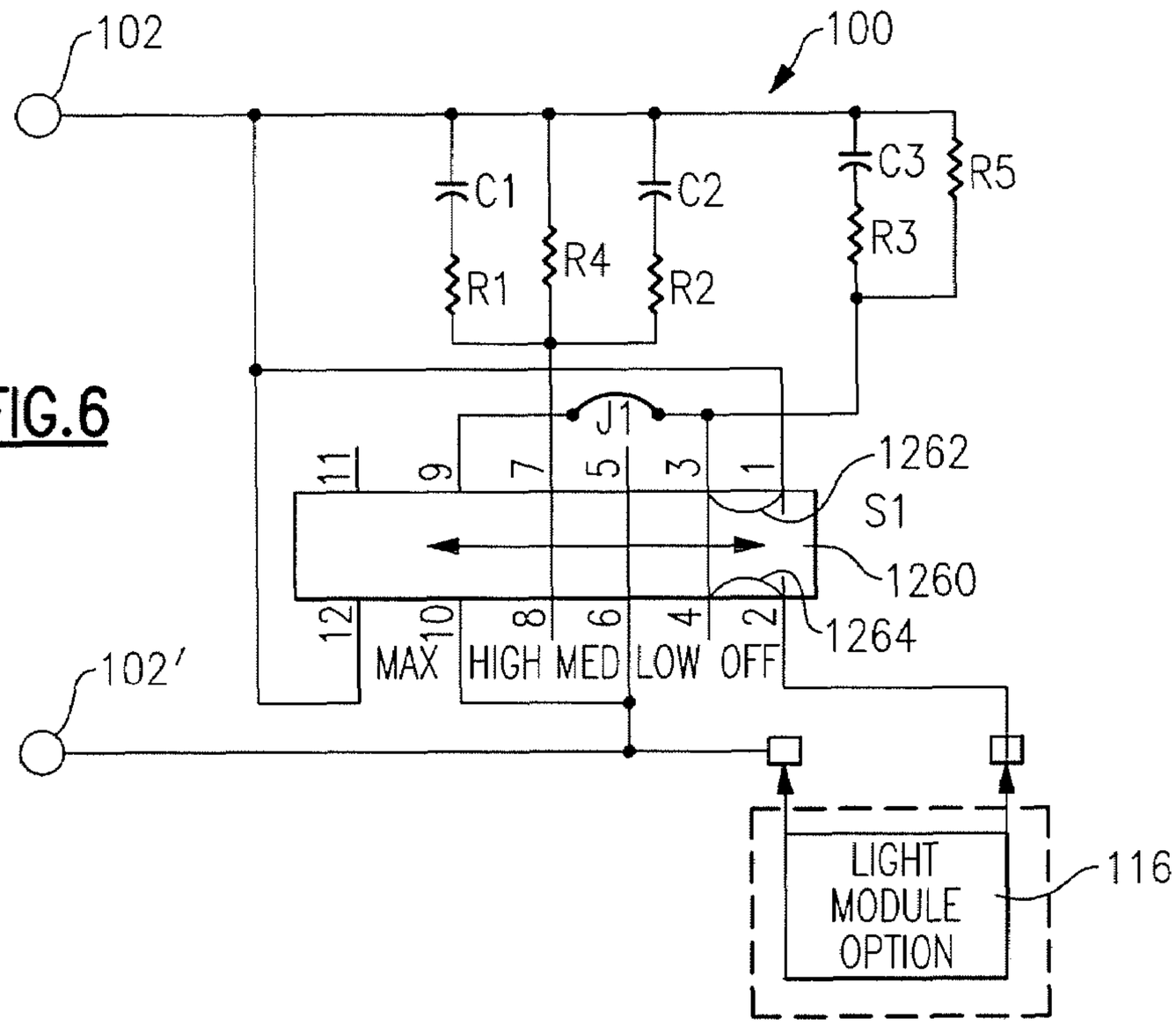

102
100
C1
C2
C3
R5
R1
R4
R2
R3
J1
11
9
7
5
3
1
1262
S1
1260
12
10
8
6
4
2
1264
MAX
HIGH
MED
LOW
OFF
102'
LIGHT
MODULE
OPTION
116

FIG.6

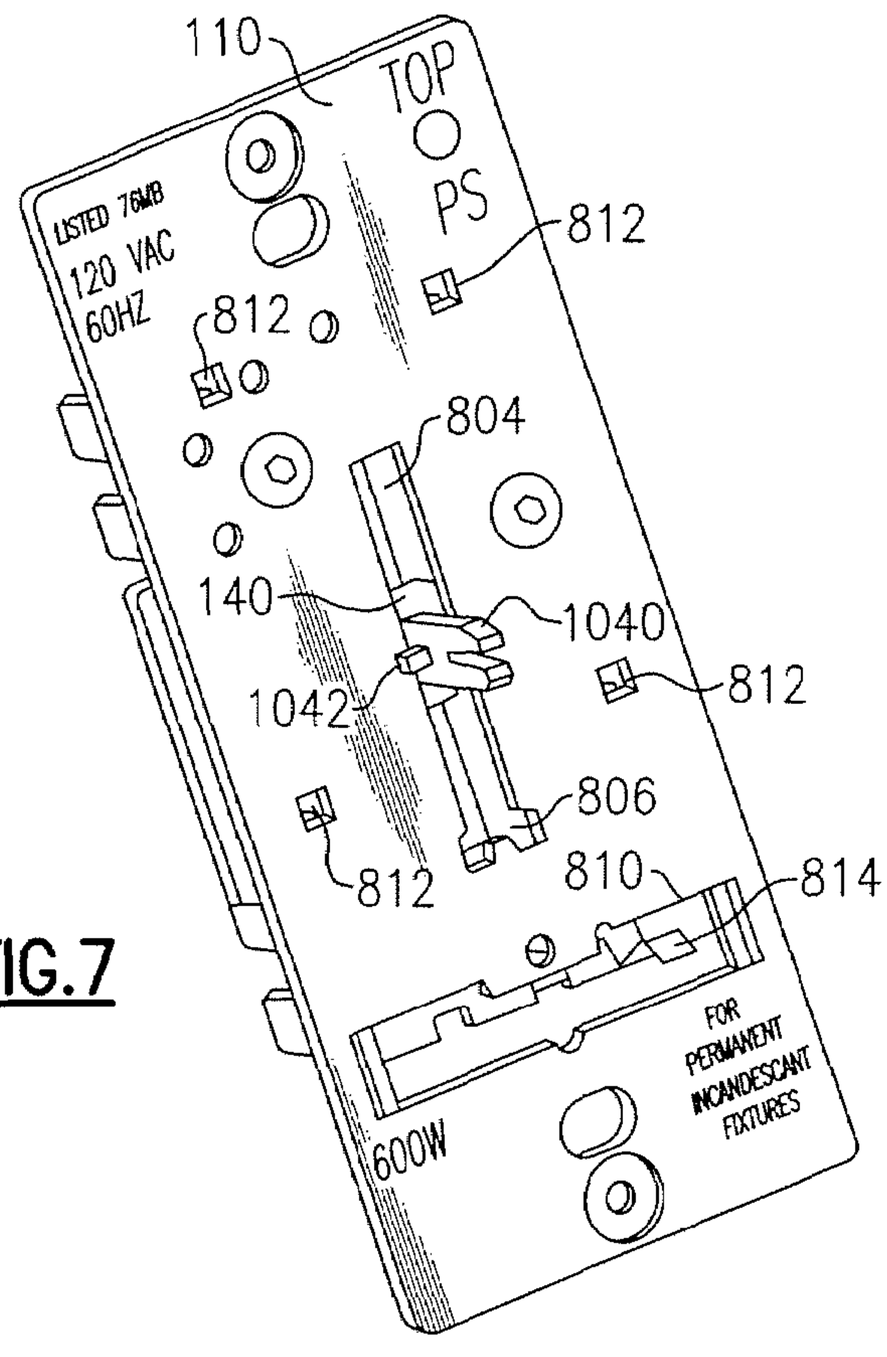

110
TOP
PS
812
LISTED 76MB
120 VAC
60HZ
812
804
140
1040
1042
812
806
812
810
814
FOR
PERMANENT
INCANDESCANT
FIXTURES
600W

FIG.7

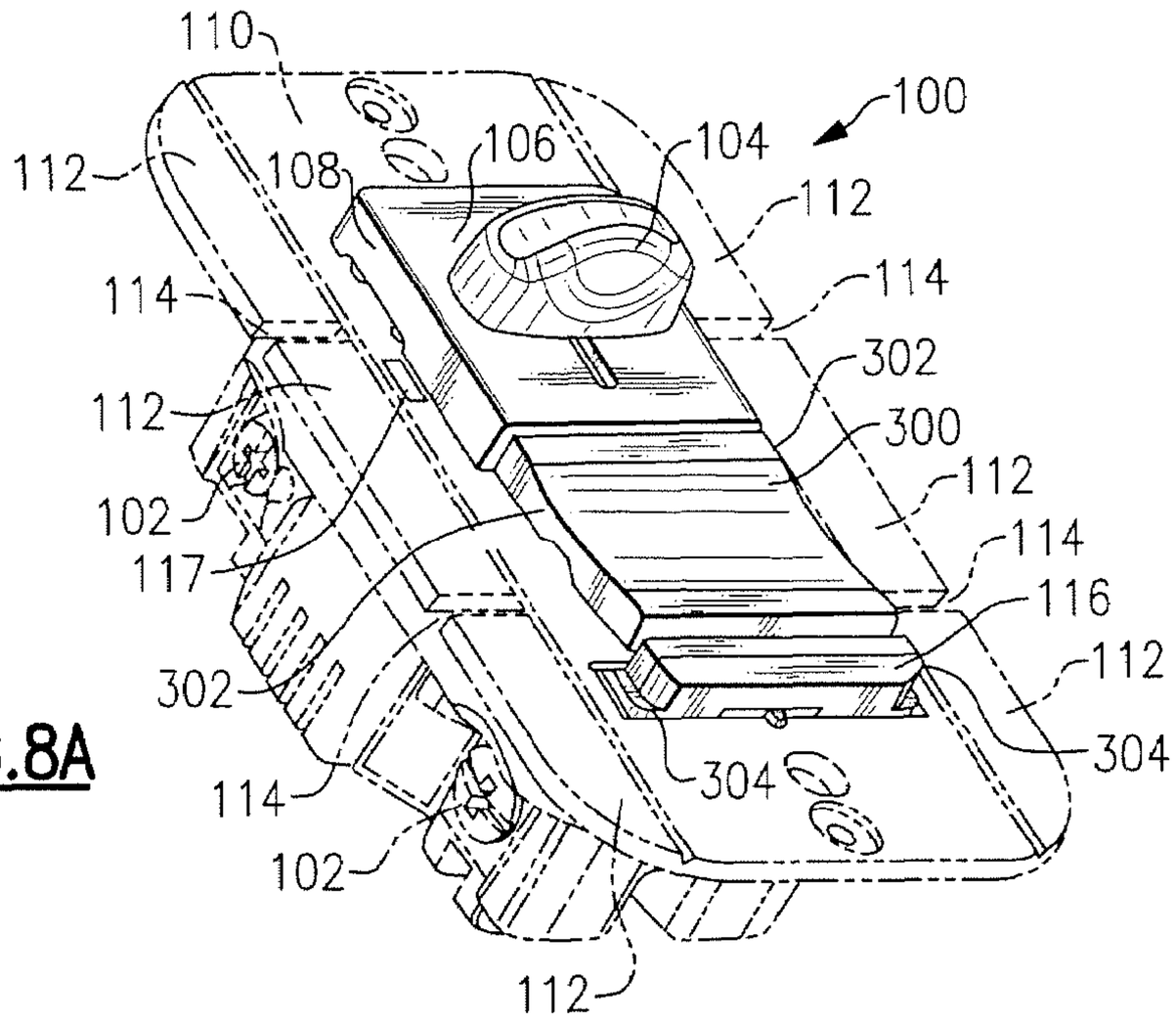

110
100
112
108
106
104
112
114
114
302
112
300
102
112
114
117
116
112
302
304
114
102
112

FIG.8A

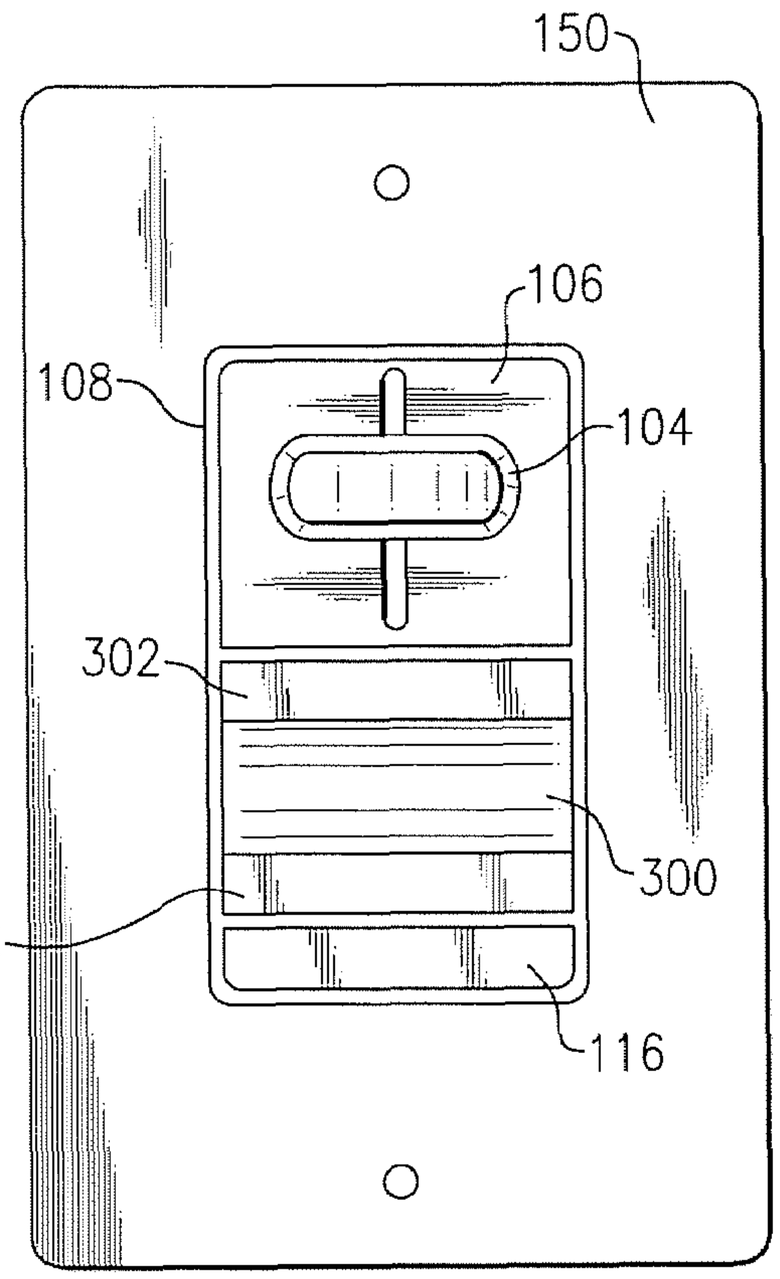

150
106
108
104
302
300
302
116

FIG.8B

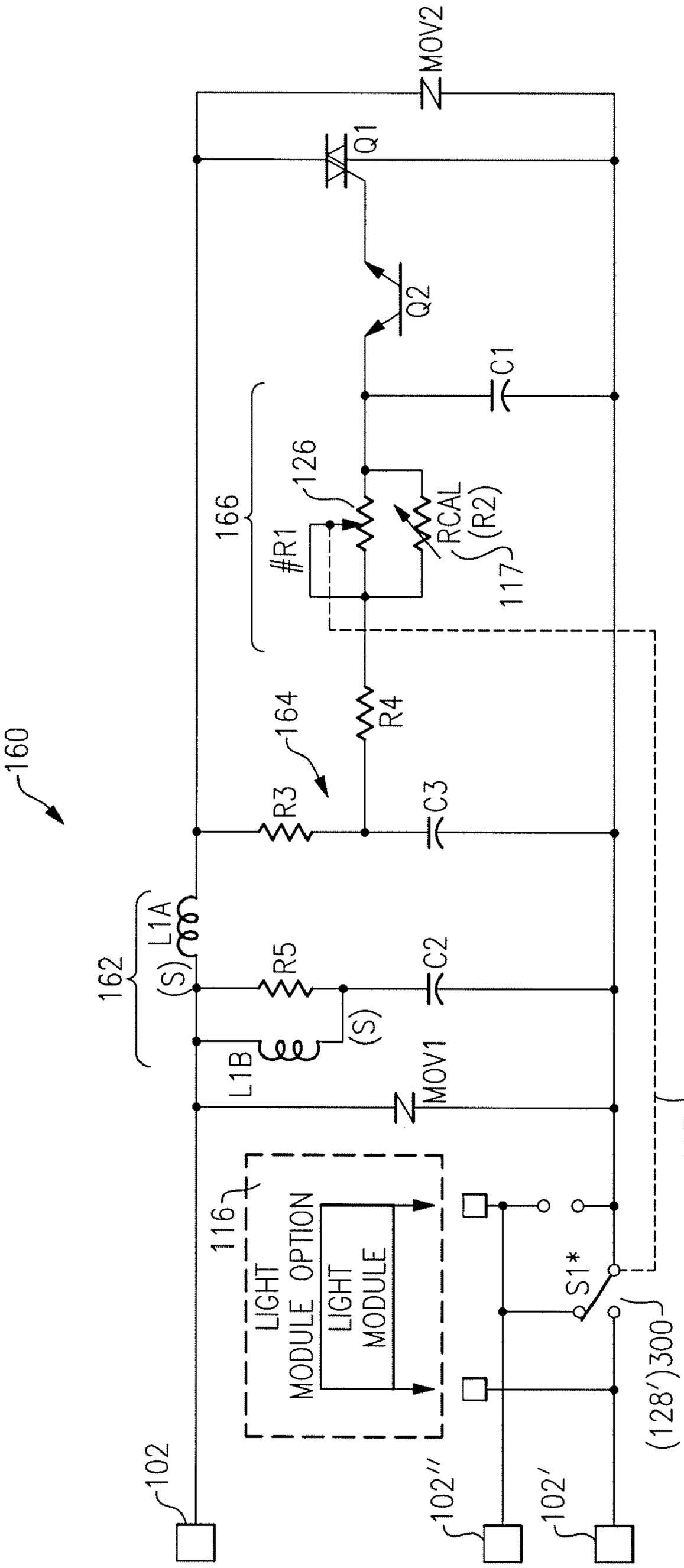

160
MOV2
Q1
Q2
C1
166
#R1
126
RCAL
(R2)
117
R4
164
R3
C3
162
(S)
L1A
R5
C2
(S)
L1B
MOV1
116
LIGHT
MODULE OPTION
LIGHT
MODULE
127
S1*
(128')300
102
102''
102'

FIG.9

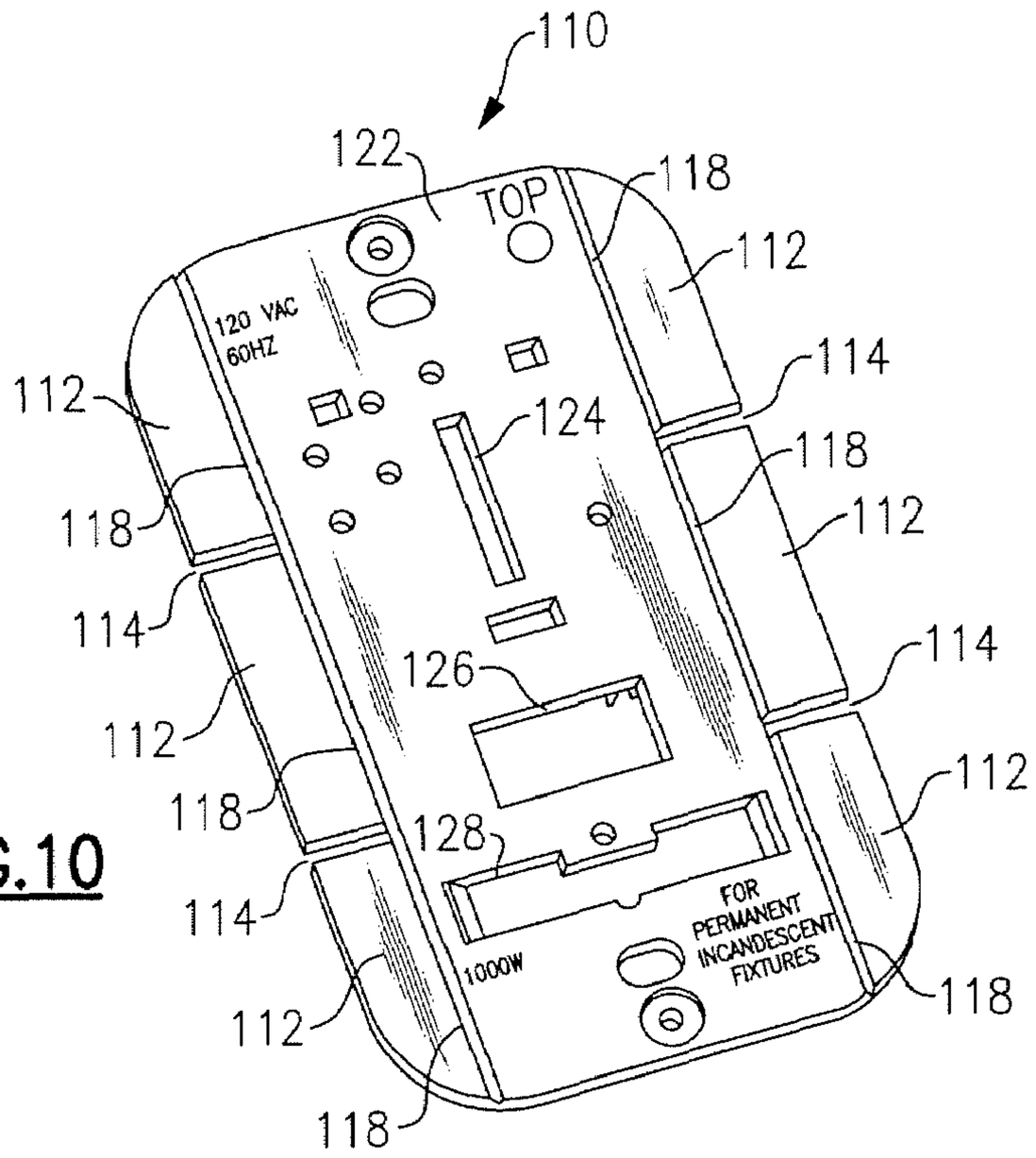

110
122
TOP
118
112
120 VAC
60HZ
112
114
124
118
118
112
114
126
114
112
118
112
128
FOR
PERMANENT
INCANDESCENT
FIXTURES
1000W
112
118
118

FIG.10

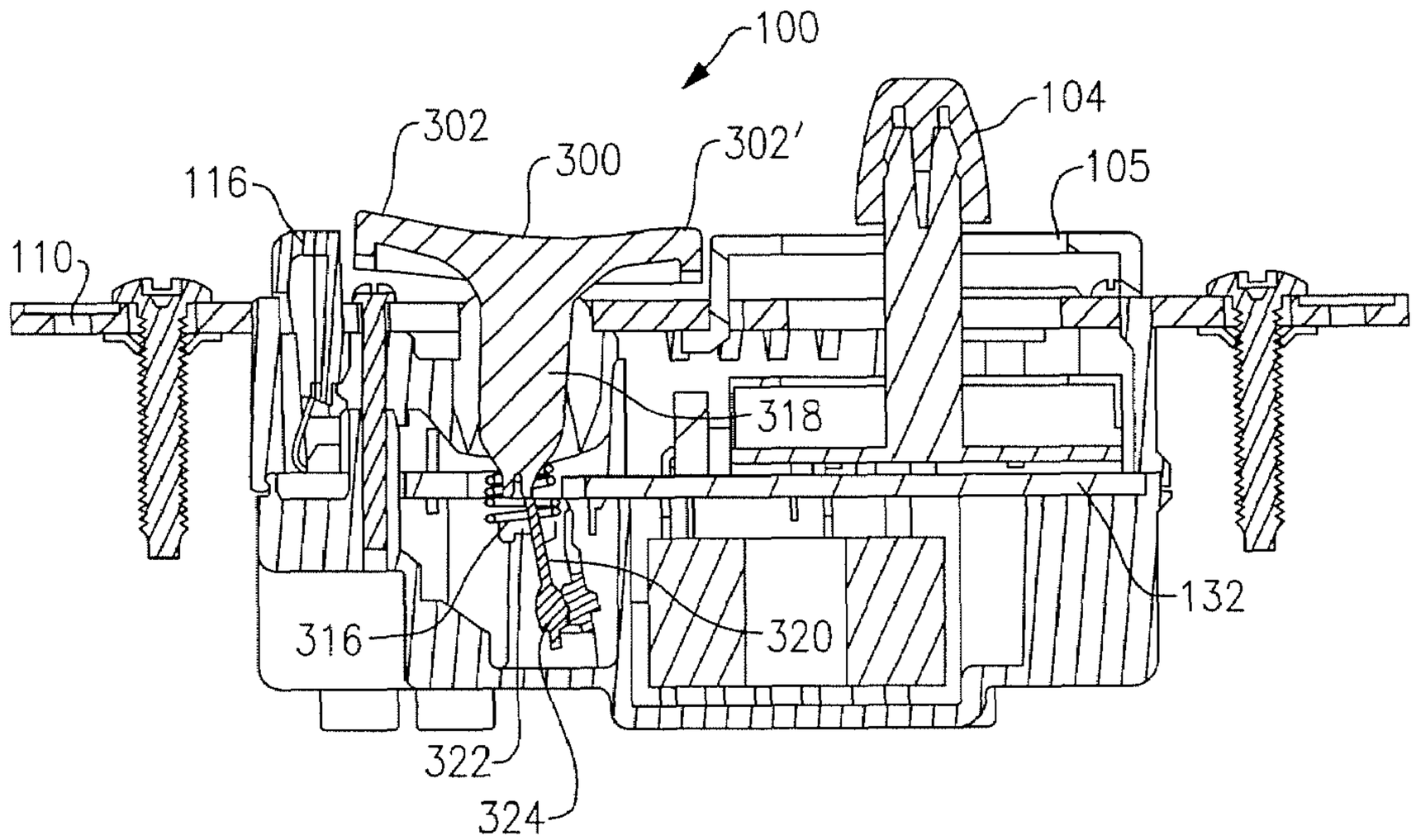

100
302
300
302'
104
116
105
110
318
316
320
132
322
324

FIG.11

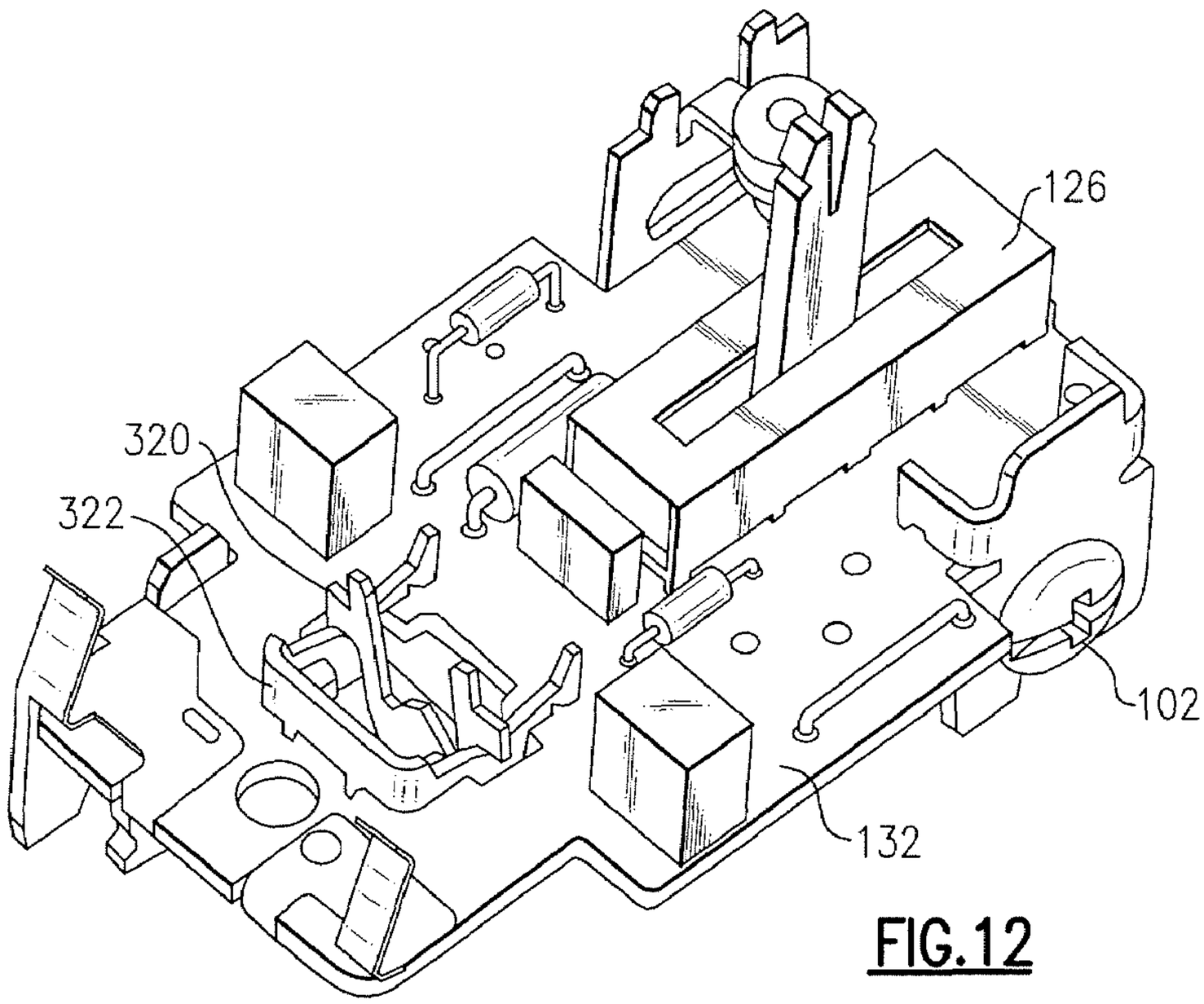

126
320
322
102
132

FIG.12

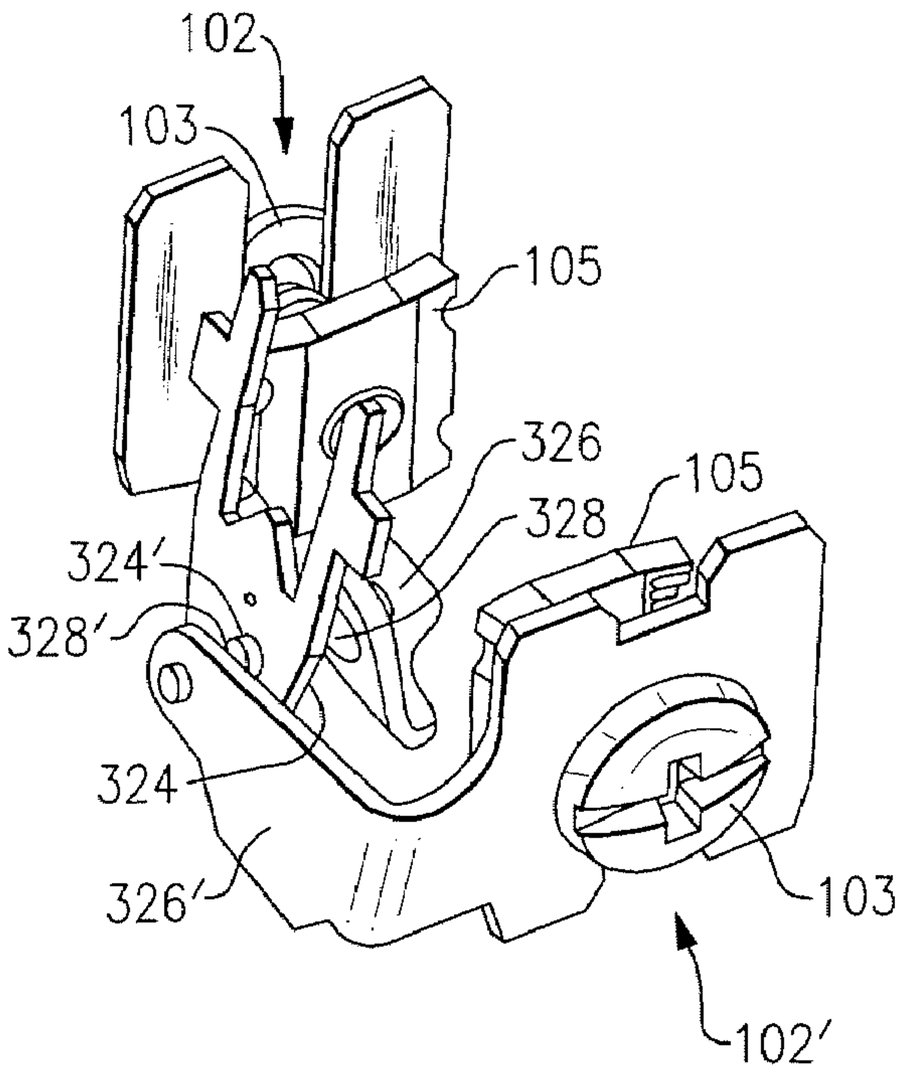

102
103
105
326
328
105
324'
328'
324
326'
103
102'

FIG.13

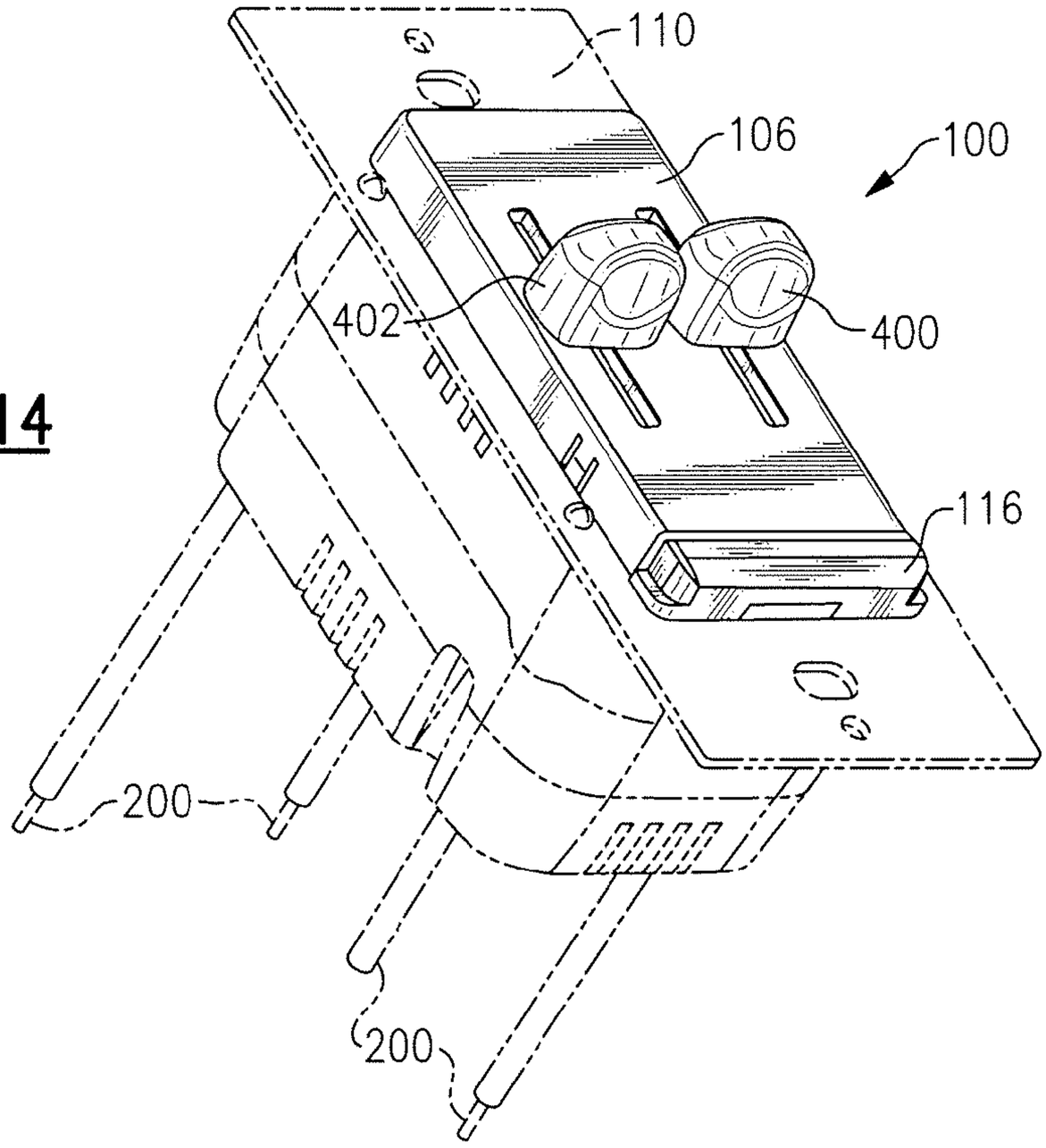

110
106
100
402
400
116
200
200

FIG.14

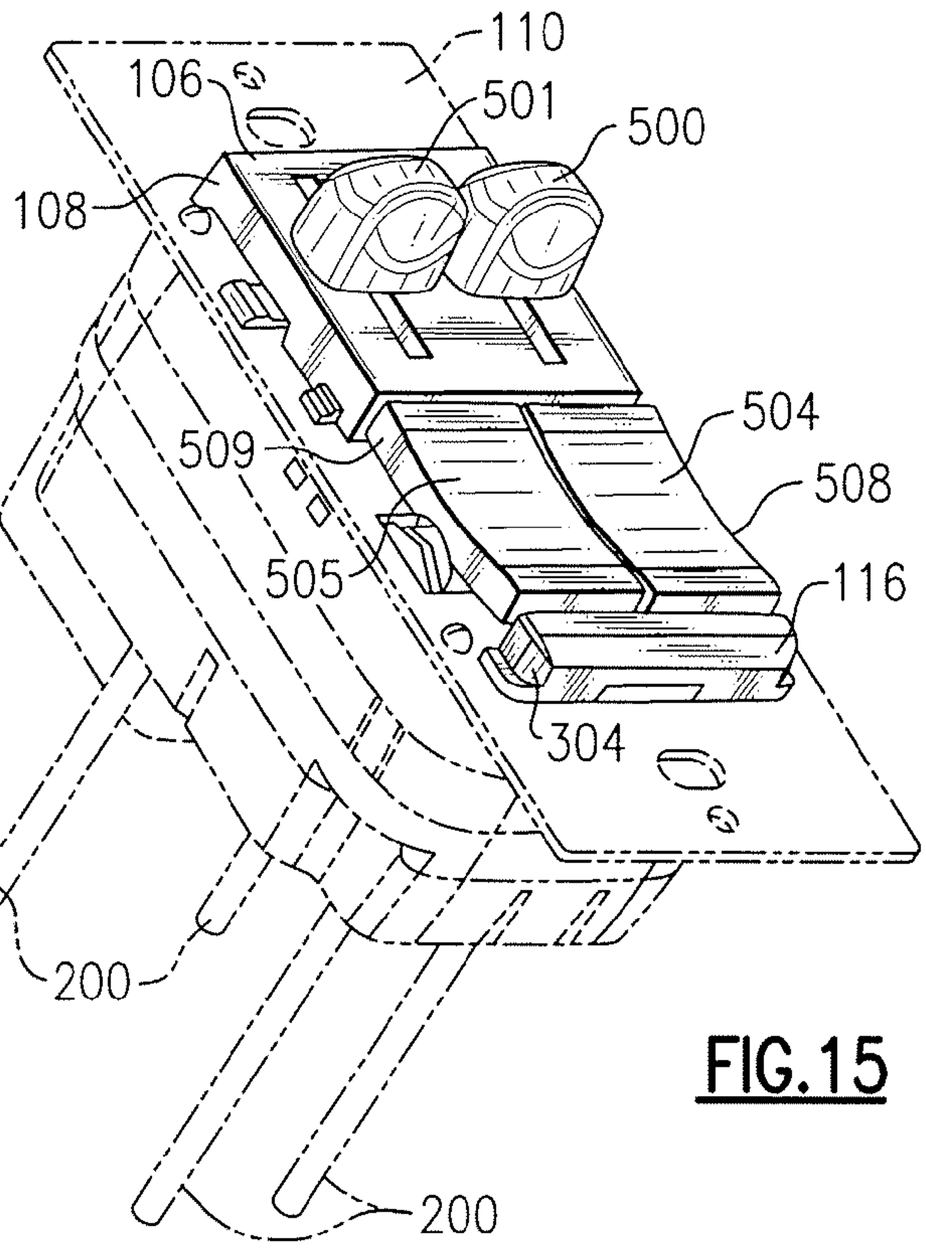

110
106
501
500
108
504
509
508
505
116
304
200
200

FIG.15

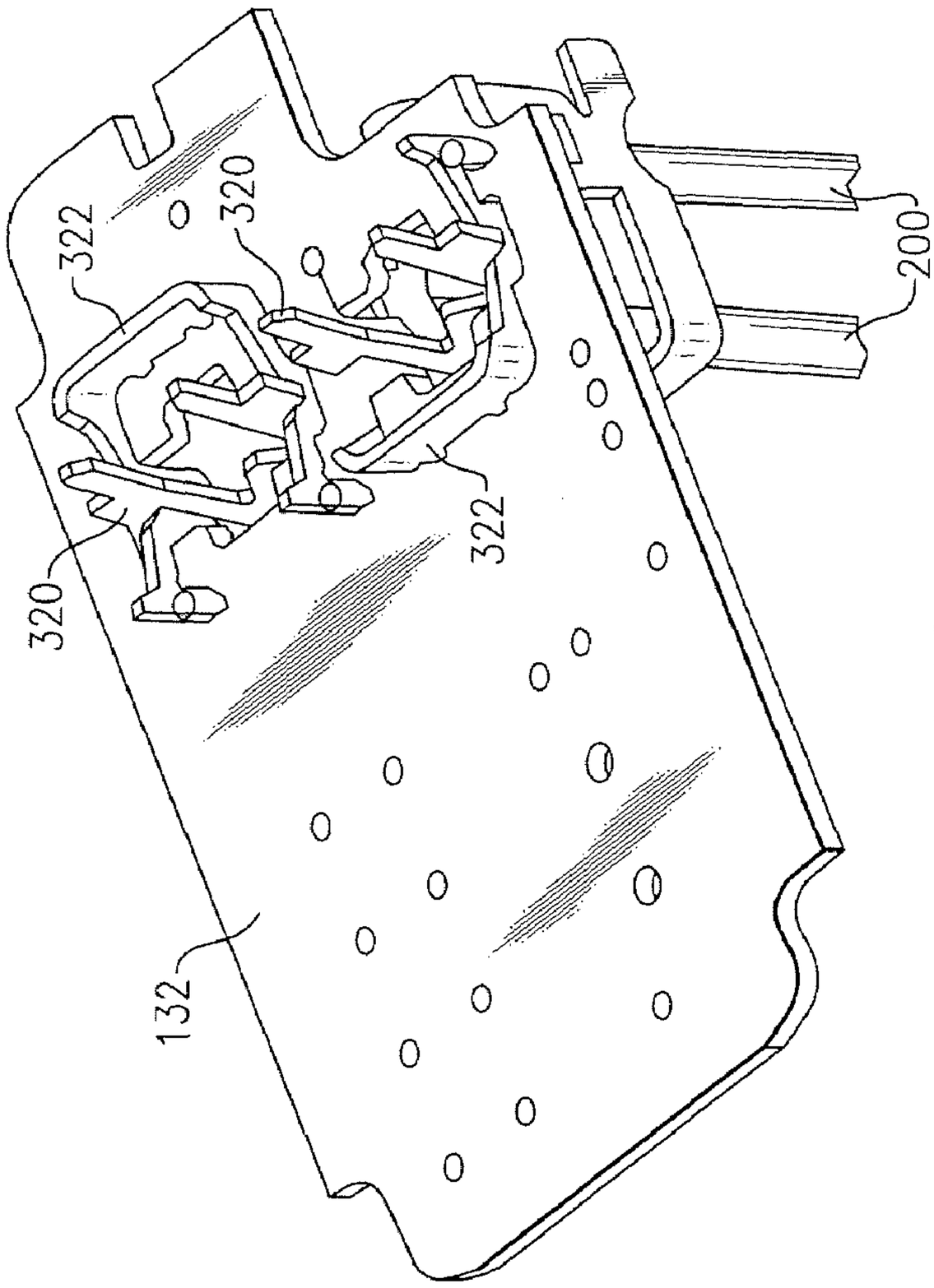


FIG.16

FIG.17

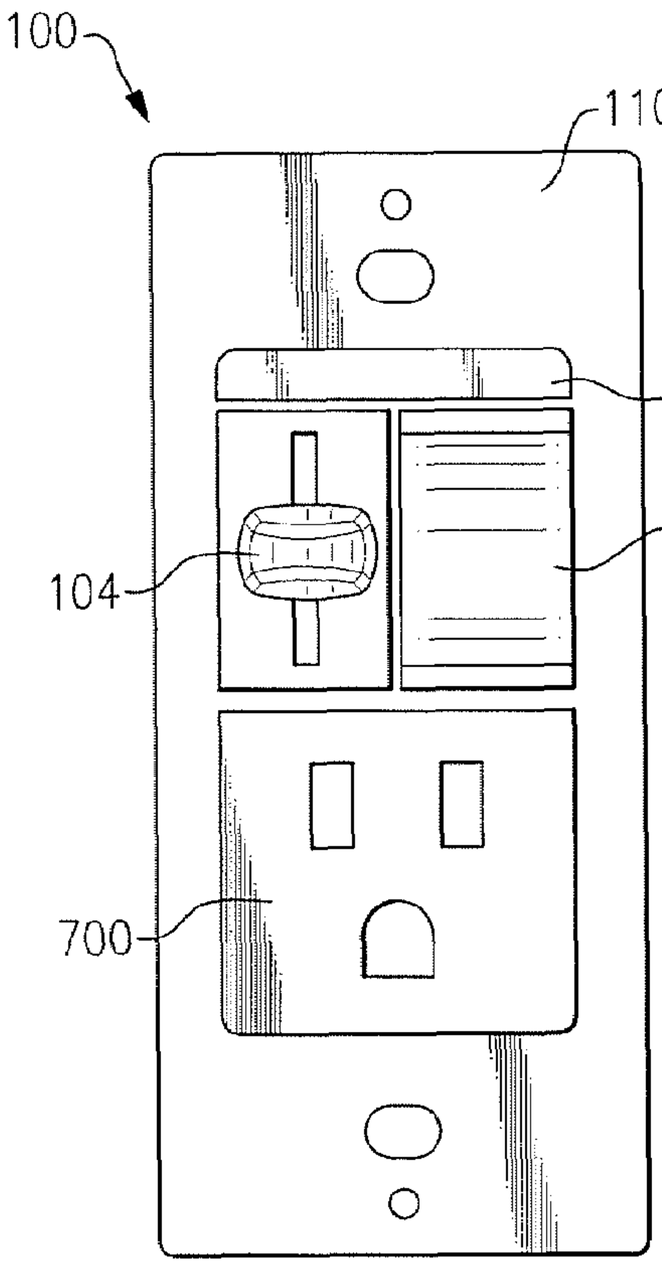


FIG.18

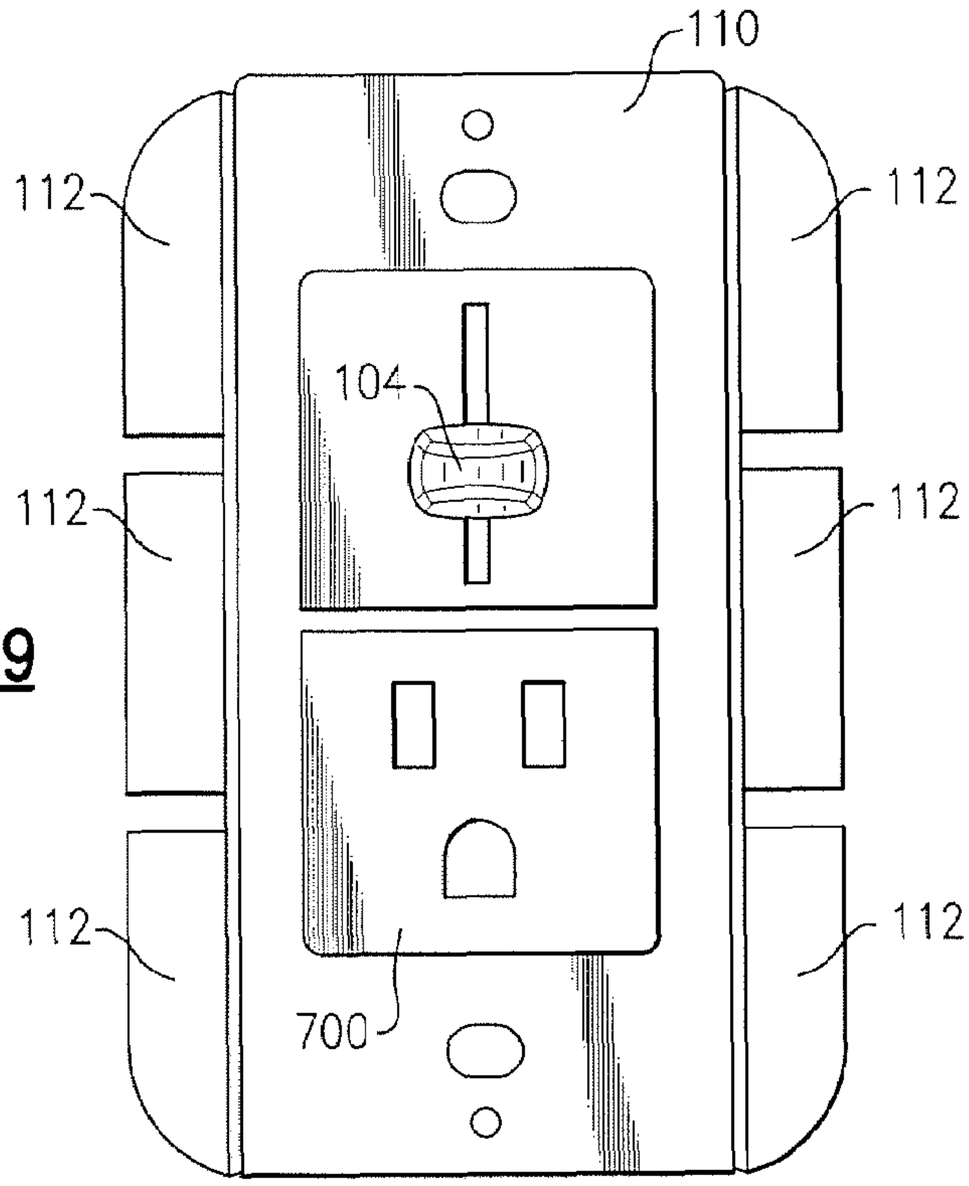


FIG.19

POWER CONTROL DEVICE FOR AN ELECTRICAL LOAD

CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part of U.S. patent application Ser. No. 10/726,173 filed on Dec. 2, 2003 now U.S. Pat. No. 7,213,932 and U.S. patent application Ser. No. 29/237,222 filed on Aug. 26, 2005, the contents of which is relied upon and incorporated herein by reference in their entirety, and the benefit of priority under 35 U.S.C. §120 is hereby claimed.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to electrical wiring devices, and particularly to power control wiring devices.

2. Technical Background

Power control devices allow a user to adjust the amount of current delivered to an electrical load, such as a light or a motor. When the electric load is a lighting device, the power control device is commonly referred to as a dimmer. If the power control device is configured to control a motor, such as a fan motor, the power control device is referred to as a motor speed controller. Motor speed controllers are also used to control the speed of machinery such as power tools, electric drills, chair lifts, stationary machinery, and other such variable speed motor driven elements.

The core component of the power control device is commonly referred to as a series pass element. The amount of current provided by the series pass element is varied by a user-actuated switch mechanism. The switch mechanism may be a continuously variable switch or a selector switch mechanism that selects from a predetermined number of discrete switch settings. The series pass element may be implemented using a solid state switch. The active switching element in a solid state switch may be a transistor, a MOSFET device, a gate turn-off device, or a thyristor device, such as silicon controlled rectifier (SCRs) or a triac device. When the series pass element in a fan speed control device is a variable impedance, the power control device is commonly referred to as a "dehummer."

As those of ordinary skill in the art will appreciate, power control devices are typically packaged in a wiring device form factor for installation in an outlet box. Of course, one or more of the power control devices described above may be disposed within the device housing. A unit equipped with both a fan motor and a lighting element, for example, may be controlled by a wiring device that includes both a dimmer and a fan speed control. The exterior of the wiring device includes either screw terminals or wire terminals for subsequent connection between the AC power source and the load. The wiring device form factor also provides a user accessible front face that is includes one or more switch mechanisms such as levers, dials, slide switches, and other such input control mechanisms that permit a user to vary the power to a load.

Prior to device installation, wiring from the AC power source and wiring to the load(s) are disposed inside the outlet box. The outlet box is usually located proximate to the load being controlled. The device is installed by connecting the wiring inside the outlet box to the appropriate wiring device terminals disposed on the exterior of the wiring device. The power control wiring device is then inserted into the outlet box and attached to the outlet box using one or more fasteners. A cover plate is installed to complete the installation.

Some of the drawbacks associated with conventional power control devices are illustrated by referring to FIG. **1**. Conventional device **10** includes a dimmer control knob **12** and switch **14** disposed in a protective frame **16**. The protective frame **16** is coupled to mounting strap **20**. The frame **16** functions as an alignment mechanism for the cover plate (not shown). The frame **16** extends through the cover plate opening when the device installation is complete. The mounting strap **20** is hidden behind the cover plate.

One drawback to this approach relates to the additional costs and complexity associated with the frame itself. Frame **16** represents an additional part that must be molded or stamped during the fabrication process. Further tooling and/or labor is required to assemble the frame **16**, dimmer control **12**, and switch **14** to mounting strap **20**. Thus, the elimination of a superfluous framing element translates to a device that is easier and cheaper to manufacture. Protective frame **16** also requires a specially sized, non-standard wall plate. This option is less attractive to users because of the difficulty in acquiring a replacement cover plate in the event that it becomes cracked or damaged. Wall plates conforming to the dimensional characteristics defined by the ANSI/NEMA WD6 standard are ubiquitous and easily obtained in an after market transaction.

Another drawback to conventional devices relates to device cleaning and maintenance issues. The protective frame **16** creates dust collecting crevices between the frame and the switch elements, and between the frame and the wall plate. Recessed surface **24** also tends to collect dirt and grime. On the other hand, the crevices and recessed surfaces are difficult to reach and, therefore, difficult to keep clean. Accordingly, unsightly dirt and grime tend to accumulate in the crevices and on the recessed surface **24**. To make matters worse, dust particles have a tendency to migrate into the interior of device **10**. Those of ordinary skill in the art will appreciate that dust build-up may effect the operation of interior switch components.

Yet another drawback to the conventional device shown in FIG. **1** relates to the lack of a locator lamp or pilot light. A person unfamiliar to the layout of the living space may have difficulty locating the power control wiring device when the space is darkened. The person attempts to "feel" his way around the room in an attempt to locate the dimmer switch. Obviously, this scenario represents a safety hazard. One approach that may be considered incorporates a dedicated lamp into the device housing. Of course, this approach has its own drawbacks. Dedicated lamps of this nature are permanently illuminated. When the lamp burns out, the entire wiring device must be replaced as well.

What is needed is a power control device that includes self aligning user-actuated switching elements that eliminate superfluous framing elements and is easier and relatively less costly to produce. What is also needed is a power control device that employs wall plates that conform to the ANSI/NEMA WD6 standard for wall plates. What is further needed is a power control device that eliminates the cleaning and maintenance issues of conventional devices. Finally, a power control device is needed that includes a modular light assembly that includes a removable light module.

SUMMARY OF THE INVENTION

The present invention addresses the needs described above by providing a power control device that includes self aligning user-actuated switching elements. The power control device of the present invention also conforms to the ANSI/NEMA WD6 standard for wall plates. The power control

device of the present invention eliminates the cleaning and maintenance issues of conventional devices because the self aligning user-actuated switching elements do not include crevices or recessed surfaces that tend to collect dust, dirt and/or grime. Finally, the present invention may be equipped with a modular light assembly that includes a removable light module.

One aspect of the present invention is directed to a device for adjustably providing power to at least one electrical load. The device includes a body member. A plurality of terminals are configured to be coupled to a source of the power. A power control circuit is disposed in the body member and coupled between the plurality of terminals and the at least one electrical load. The power control circuit includes at least one variable control mechanism coupled to at least one series pass element. The at least one series pass element is configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting. A frameless front cover member is connected to the body member and has a raised rectangular form factor substantially corresponding to a standard wall plate opening. The frameless front cover assembly has a plurality of switch mechanisms including at least one first switch mechanism coupled to the at least one variable control mechanism and at least one second switch mechanism actuatable without interference from the standard wall plate. The at least one first switch mechanism and the at least one second switch mechanism are characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening.

In another aspect, the present invention is directed to a device for adjustably providing power to at least one electrical load. The device includes a body member. A plurality of terminals are configured to be coupled to a source of the power. A power control circuit is disposed in the body member and coupled between the plurality of terminals and the at least one electrical load. The power control circuit includes at least one variable control mechanism coupled to at least one series pass element. The at least one series pass element is configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting. A frameless front cover assembly is connected to the body member. The frameless front cover assembly includes at least one switch mechanism coupled to the at least one variable control mechanism. The frameless front cover assembly has a raised rectangular form factor substantially corresponding to a standard wall plate opening. The frameless front cover assembly is characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening. A modular lamp assembly is disposed in longitudinal alignment with the frameless front cover assembly. The modular lamp assembly is characterized by the transverse dimension, the modular lamp assembly and the frameless front cover assembly in combination being characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

In yet another aspect, the present invention is directed to a device for adjustably providing power to at least one electrical load. The device includes a body member. A plurality of terminals are configured to be coupled to a source of the power. A power control circuit is disposed in the body member and coupled between the plurality of terminals and the at least one electrical load. The power control circuit includes at least one variable control mechanism coupled to at least one series pass element. The at least one series pass element is configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting. A frameless front cover member is connected to the body member and has a raised rectangular form factor substantially corresponding to a standard wall plate opening. The frameless front cover assembly has a plurality of switch mechanisms including at least one first switch mechanism coupled to the at least one variable control mechanism and at least one second switch mechanism actuatable without interference from the standard wall plate. The at least one first switch mechanism and the at least one second switch mechanism are characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening. A modular lamp assembly is disposed in longitudinal alignment with the frameless front cover assembly. The modular lamp assembly is dimensionally characterized by the transverse dimension. The modular lamp assembly and the frameless front cover assembly in combination are dimensionally characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

Additional features and advantages of the invention will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the invention as described herein, including the detailed description which follows, the claims, as well as the appended drawings.

It is to be understood that both the foregoing general description and the following detailed description are merely exemplary of the invention, and are intended to provide an overview or framework for understanding the nature and character of the invention as it is claimed. The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate various embodiments of the invention, and together with the description serve to explain the principles and operation of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a conventional power control device;

FIG. **2**A is a perspective view of a power control device in accordance with a first embodiment of the present invention;

FIG. **2**B is a plan view of the power control device depicted in FIG. **2**A disposed in a standard wall plate;

FIG. **3** is a schematic diagram of the power control device shown in FIG. **2**A;

FIG. **4** is a cross-sectional side view of the power control device depicted in FIG. **2**A;

FIG. **5** is a perspective view of a power control device in accordance with a second embodiment of the present invention;

FIG. **6** is a schematic diagram of a fan speed control circuit in accordance with the embodiment depicted in FIG. **5**;

FIG. **7** is a perspective view of the mounting strap and control actuator interface depicted in FIG. **5**;

FIG. **8**A is a perspective view of a power control device in accordance with a third embodiment of the present invention;

FIG. **8**B is a plan view of the power control device depicted in FIG. **8**A disposed in a standard wall plate;

FIG. **9** is a schematic diagram of the power control device shown in FIG. **8**A;

FIG. **10** is a top view of the heat sink mounting strap depicted in FIG. **8**A;

FIG. **11** is a cross-sectional view of the device shown in FIG. **5**;

FIG. **12** is a perspective view of a portion of the printed circuit board assembly depicted in FIG. **11**;

FIG. **13** is a detail view of the paddle switch mechanism depicted in FIG. **12**;

FIG. **14** is a perspective view of a power control device in accordance with a fourth embodiment of the present invention;

FIG. **15** is a perspective view of a power control device in accordance with a fifth embodiment of the present invention;

FIG. **16** is a detail view of the paddle switch mechanism depicted in FIG. **15**;

FIG. **17** is a perspective view of a portion of the printed circuit board assembly depicted in FIG. **16**;

FIG. **18** is a plan view of a power control device in accordance with a sixth embodiment of the of the present invention; and

FIG. **19** is a plan view of a power control device in accordance with a seventh embodiment of the of the present invention.

DETAILED DESCRIPTION

Reference will now be made in detail to the present exemplary embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. An exemplary embodiment of the power control device of the present invention is shown in FIG. **1**, and is designated generally throughout by reference numeral **100**.

In accordance with the invention, the present invention is directed to a device for adjustably providing power to at least one electrical load. The device includes a body member. A plurality of terminals are configured to be coupled to a source of the power. A power control circuit is disposed in the body member and coupled between the plurality of terminals and the at least one electrical load. The power control circuit includes at least one variable control mechanism coupled to at least one series pass element. The at least one series pass element is configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting. A frameless front cover member is connected to the body member. The frameless front cover member includes at least one switch mechanism coupled to the at least one variable control mechanism. The frameless front cover member has a raised rectangular form factor substantially corresponding to a standard wall plate opening. The frameless front cover member is characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening.

As embodied herein and depicted in FIG. **2**A, a perspective view of a first embodiment of the power control device is shown. Device **100** includes a mounting strap **110**, which functions as the device heat sink, coupled between a user accessible front cover portion **106** and device body member **120**. A light module **116** is disposed between cover member **106** and an end portion of front cover portion **106**. Device **100** includes screw terminals **102** which are provided to connect device **100** to both the voltage source and the load. A control knob **104** is disposed on the user accessible cover member **106** and is employed to adjust the power delivered to the load.

Power control device **100** may include a light module **116**. Light module **116** may be configured to emit light when the control knob **104** is in the full OFF position. In this embodiment, lamp **116** operates as a locator for power control device **100** such that device **100** may be located by a user in a darkened room. In an alternate embodiment, lamp **116** serves as a pilot light, emitting light when power control device **100** is not in the fully OFF position. A pilot light allows the user to identify the power control device that is in use. Lamp module **116** includes a circuit that results in a steady light emission or, alternatively, that results in a blinking light emission, occurring during an intended circumstance for light emission such as has been described. In another embodiment of the present invention, lamp **116** is a removable lamp module.

In yet another embodiment, the removable lamp module may be replaced by a blank member. The blank member allows the power control device **100** to be reconfigurable from an illuminated device to a non-illuminated device, and vice-versa, in accordance with the user's requirements. Reference is made to U.S. patent application Ser. No. 10/726,173 and U.S. patent application Ser. No. 10/726,128 which are incorporated herein by reference as though fully set forth in its entirety, for a more detailed explanation of a lamp module, a removable lamp module and the blank member.

FIG. **2**B is a plan view of the power control device depicted in FIG. **2**A disposed in a standard wall plate **150**. In particular, the frameless front cover member **106** has a raised rectangular form factor, as evidenced by raised edge **108**, that substantially corresponds to the standard wall plate opening and extends therethrough. The transverse dimension of frameless front cover member **106** is substantially equal to the transverse dimension of the standard wall plate opening. The gap between wall plate **150** and cover member **106** is slightly exaggerated in FIG. **2**B. The planar surface of member **106** is approximately flush with the exposed surface of the wall plate. Accordingly, the cover plate cannot interfere with actuation of control knob **104**. Furthermore, there are no inaccessible crevices or recessed surfaces that inhibit cleaning. The term "standard wall plate" is defined herein as a wall plate that conforms with the dimensions provided by the ANSI/NEMA WD6 standard.

As embodied herein and depicted in FIG. **3**, a schematic diagram for the power control device depicted in FIG. **2**A is shown. The device is connected to the electrical distribution system by connecting the load between the hot line and terminal **102**. Terminal **102'** is connected to the return line. Light module **116** is configured to visibly display an operative condition of the power control device. As is shown by way of example in FIG. **3**, lamp module **116** is connected in series with terminal **102'**. Lamp module **116** is disposed in series with the series pass element **161**. and in parallel with control switch **128**. Control switch **128** is operatively coupled to adjustable element R**1**. The coupling is denoted by dotted line **127**. Of course, light module **116** is OFF when switch **128** is in the closed position and ON when switch **128** is in the open position. Control switch **128** is configured to close when adjustable element R**1** is adjusted for maximum (or near maximum) current through series pass element Q**1**. This type of switch is known as a "full-on switch" or "full-on bypass switch." A purpose of the full-on switch is to operate the light module as a nightlight as will be explained.

In an alternate embodiment control switch **128** is configured to open when the reset element is adjusted for minimum (or near minimum) current through series pass element Q**1**. This type of switch is known as an air gap switch or a slide-to-off switch. An air gap switch ensures that there is little or no electrical current to the load that could shock someone when they are changing a light included in the load. Preferably this current level is less than 0.5 mA. This current level is too low to activate the load. The term "control switch" as used herein, is a switch that is disposed in series with the power control load that operates in response to the adjustment of the variable control mechanism.

Contact **131** of control switch **128** can be omitted to simplify or reduce the cost of assembly by employing jumper **129**. Jumper **129** may be implemented using any suitable means, such as a solder bridge, removable conductor, attachable conductor, or as an insertable conductor. In one embodiment, jumper **129** is an electrically conductive material inserted in the hole of a printed circuit board. The insertion connects circuitry together disposed on either side of the board. In other embodiments of the invention to be described, jumper **129** is omitted and the control switch functions as a single-pole double-throw switch.

In another embodiment, light module **116** is coupled across switching element Q**1** as shown by dotted line **133**. The amount of light emitted by light module **116** is in inverse relation to the power level to the load. Given the inverse relationship, the lamp module serves as a locating aid for helping to locate the power control device in an otherwise darkened room.

Power control device **100** may be susceptible to damage when an overvoltage condition exceeds about a 1,000 Volts. As those of ordinary skill in the art will appreciate, overvoltages may be caused by switching transients that occur when a load on the electric circuit is turned ON or OFF. Overvoltage conditions may also be generated by lightning induced transients. Accordingly, a metal oxide varistor MOV **1** is disposed between terminal **102** and terminal **102'** to protect device **100** from such overvoltage conditions that may occur from time to time. MOV **1** protects the device **100** by clamping the transient voltage to a safe level, i.e., less than about 500 Volts.

Device **100** also includes an RFI filter block **162** that is configured to eliminate high frequency noise generated by series pass element Q**1**. RFI filter **162** includes inductors L**1**A, L**1**B, resistor R**5**, and capacitor C**2**. The functionality of filter **164** will become clearer in the discussion provided below. RC filter circuit **164** strips off random high frequency transients that are propagating in the electrical circuit. Filtering is implemented by resistor R**3**, R**4**, and C**3**. RC circuit **164** also phase shifts the input signal by a predetermined phase angle.

The power applied to series pass element Q**1** is regulated by the variable control mechanism **166**, which is implemented using potentiometer **126** (R**1**), trim adjustment resistor **117** (R**2**), resistor R**4** and capacitor C**1**. The variable control mechanism **166** is adjusted by the user by way of the control knob switch **104** (See FIG. **2**A). Of course, potentiometer **126** is the adjustable element R**1** in circuit **166**. An RC circuit, such as the one implemented by potentiometer **126**, resistor R**4**, and C**1**, may be characterized by a time constant (τ). In this case, time constant τ corresponds to a delay between the zero-crossing of the AC signal and the firing angle of the circuit. In other words, circuit **166** is configured to turn transistor Q**2** ON at a predetermined point during the AC cycle. Transistor Q**2** works in concert with capacitors C**1** and/or C**3** in providing triac Q**1** with a current high enough to turn triac Q**1** ON. Thus, circuit **166** is configured to drive Q**1** to cycle the power to the load ON and OFF a predetermined number of times during each AC cycle.

Trim adjustment resistor **117** is discussed in greater detail in the embodiment depicted in FIG. **8**A. Suffice it to say at this point that trim resistor **117** may be used to calibrate device **100** to a fan motor or adjust the minimum light intensity provided by the dimmer.

Referring back to light module **116**, those of ordinary skill in the art will understand that module circuit **116** may be configured such that the amount of light emitted by the lamp assembly is either unaffected by, or related to the percentage of time that current is being supplied by the power control device to the load. The relationship may be either a direct relationship or an inverse relationship. If there is a direct relationship, the lamp module serves to indicate the amount of power being provided to the load. If there is an inverse relationship, the lamp module serves as a locating aid for helping to locate the power device in an otherwise darkened room.

The functionality of MOV **1** was discussed above. MOV **1** may be of any suitable type, but there is shown by way of example a movistor that is about 12 mm in diameter, or larger. A movistor of this size is capable of absorbing the energy levels described previously. Other surge suppression devices, such as spark gaps, gas discharge devices, capacitors, and/or zener diodes may be used in combination with MOV **1**. In alternate embodiments, the aforementioned other surge suppression devices may replace MOV **1** altogether.

In an alternate embodiment of the present invention, MOV **1** is omitted and MOV **2** is disposed across the series pass element. MOV **2** protects the series pass element and other components from overvoltage conditions. MOV **2** is in series with the RFI filter (L**1**A, L**1**B, C**2**, R**5**). Of course, with all things being equal, the amount of current propagating through MOV **2** is typically not as great as the current through MOV **1** due to the series impedance of the RFI filter. Since MOV **2** does not have to dissipate as much energy as MOV **1** due to the reduced current, MOV **2** may be a comparatively smaller than MOV **1**. Accordingly, MOV **2** may be about 7 mm in diameter.

In yet another alternate embodiment, MOV **2** and MOV **1** may be used in combination. In this arrangement, MOV **2** protects the series pass element Q**1** and other components, while MOV **1** protects components such as the RFI circuit.

Referring to FIG. **4**, a cross-sectional view of the power control device depicted in FIG. **2**A is shown. Dimmer control knob **104** is connected to a rectangular stem member **1040** that extends through a slot **124** formed in mounting strap/heat sink **110**. The non-accessible end of the slide member **1040** is connected to switch actuator **140**. Switch actuator **140** is configured to slide within potentiometer **126** to vary the displacement of slide switch **128**. Control switch (slide switch) **128** includes cantilever beam **130** which is electrically connected to a printed circuit board **132**. Slide switch **128** also includes contact **134** and fixed contacts **136** or **138**. Fixed contacts **136**, **138** are alternate embodiments that are discussed below.

If contact **136** is employed, cantilever beam **130** is prebiased such that there is electrical connectivity between the cantilever beam and contact **136**. When the user moves control knob **104** to the right, actuator **140** will eventually cause contacts **134** and **136** to separate. On the other hand, if the switch may employ contact **138**. In this case, as control knob **104** is moved to the right, actuator **140** urges cantilever beam **130** to deflect toward contact **138** to establish electrical connectivity.

In an alternate embodiment, a second control switch (not shown) is disposed in device **100**. The second control (slide) switch **128'** is similar in structure to slide switch **128** except that it is oriented in the opposite direction. Whereas cantilever beam **130** deflects when actuator **140** is moved to the right, the cantilever beam included in control switch **128'** deflects when actuator **140** moves to the left. The control switches serve to provide a full-on capability at one end of the potentiometer adjustment and full-off capability at the other end of the potentiometer adjustment. Switch **128'** is coupled across switching element Q**1** (see FIG. **3**). Switch **128'** is shown as coupled to adjustable element R**1** by dotted line **127'**.

The depth behind the mounting strap, represented by dimension "d" is the distance between the mounting strap and a rearward surface of rear body member **122**. The dimension "d" is typically less than or equal to approximately 1.20 inches.

The cross-sectional view provided by FIG. **4** reveals that wiring terminals **102** may include screw terminals **103** (FIG. **2**A) as well as pressure plates **105**. Thus, device **100** may be connected to the electrical circuit by fastening the electrical wiring to terminals **102** by wrapping the wire around the shank of a terminal screw **103** and tightening the screw. Alternatively, the wire may be inserted between pressure plate **105** and the head of the terminal screw. Again, the screw is subsequently tightened causing the wire to be clamped by the plate and the screw head. Terminals **102** may also include a clip into which a wire is inserted. After inserted, the clip closes to fasten the wire to the terminal. Regardless of the method of connecting the electrical wiring to device **100**, after the wiring is connected to the terminals **102**, installation is completed by inserting fasteners **124** into apertures formed in the end portions **122** of strap **110**.

As embodied herein and depicted in FIG. **5**, a perspective view of a second embodiment of the power control device **100** is shown. This embodiment is directed to a multi-position fan speed control device. Control knob **104** allows the user to select five discrete positions including OFF, LOW, MEDIUM, HIGH, and MAXIMUM. The body member **220** includes a greater interior volume than the body member **120** employed in FIG. **3**. Note also that device **100** employs wire terminals **200** instead of the screw terminals provided in the first embodiment. The additional volume is required to accommodate the capacitors employed in the switching circuit (not shown). The mounting strap **201** employed in the second embodiment is similar to the heat sink **110** shown in FIG. **3**. One notable exception is that mounting strap **201** does not include any removable tabs. A ground terminal **202** coupled to mounting strap **201** and disposed at an exterior location on body member **220** permits mounting strap **201** to be electrically connected to a ground wire. Since removable tabs **112** are not provided in this embodiment, ground terminal **202** may be disposed along any of the edges of mounting strap **201**.

Referring to FIG. **6**, a schematic diagram of the multi-position fan speed control device depicted in FIG. **5** is shown. The device **100** is connected to the electrical distribution system via terminals (wires) **200**. The fan motor load is coupled in series with device **100** to the source voltage of the electrical distribution system. The basis of this embodiment is discrete step switch element **1260** which is coupled to the control knob **104**. Thus, control knob **104** may be employed by a user to select between any one of five positions including OFF, LOW, MED, HIGH, and MAX. As those of ordinary skill in the art will appreciate, switch element **1260** is the functional equivalent of the variable control circuit and is coupled to the series pass element. The series pass element is implemented by an RC circuit that includes capacitors C**1**, C**2**, C**3**.

The second embodiment of the present invention also includes a light module **116**. Again, the light module **116** functions as a locator light. When switch **1260** is placed in the OFF position, current is applied to the light module **116**. Light is thus emitted when device **100** is turned OFF. Thus, a person entering a darkened room may easily locate the control because the light emitted by module **116** functions as a location beacon.

Switch **1260** operates as follows. Control knob **104** is shown in the OFF position. In the OFF position, switch contacts **1** and **3** are shorted together by shorting structure **1262** and contacts **2** and **4** are shorted together by shorting structure **1264**. As the switch is stepped from the OFF position to the MAX position, the bridging structures advance each time to short the next pair of adjacent terminals. When knob **104** is stepped all the way to the MAX position, contacts **9** and **11** are shorted together and contacts **10** and **12** are shorted together. At the MAX position, there is little or no impedance between terminals **200**.

In an alternate embodiment, light module **116** is disposed across contacts **11** and **12** (not shown). When light module **116** is not emitting light, the user realizes that the fan is fully activated.

Referring to FIG. **7**, a detail view of the mounting strap and control actuator interface suitable for FIGS. **2-6** is shown. The user adjusts the amount of power delivered to the load by manipulating control knob **104**. Control knob stem **1040** extends through slot **804** to connected with switch actuator **140**. Stabilizer element **1042** is disposed in a transverse direction relative to stem portion **1040**. The stabilizer element **1042** facilitates the movement of actuator **140** along the longitudinal axis of slot **804**. Stabilizer **1042** and switch actuator **140** limit the torquing motion when the control knob **104** is manipulated by the user. In the continuously variable embodiments of the present invention, a portion of actuator **140** slides within potentiometer **126**. In the step-wise adjustable embodiment, control stem **1040** moves between the discrete positions provided by switch **1260**.

Slot **804** has an enlarged region **806** that permits switch actuator **140** and strap **110** to be assembled. A subsequent assembly step may add a barrier (not shown) that prevents switch actuator **140** from re-entering the enlarged region. In an alternate embodiment, the enlarged region may be omitted if the switch actuator **140** is disposed on one side of the mounting strap **110** and stabilizer **1042** is subsequently attached to the actuator.

Strap **110** also includes an opening **810** that is configured to accommodate light module **116**. Contact mechanism **814** is configured to engage the light module contact mechanism. If the user employs a blank module instead of a light module, contact mechanism **814** is covered by the blank module and not accessible to a user. The mounting strap **110** also includes holes **812** that accommodate the front cover snaps that are used to connect front cover **106** to the strap **110**.

As embodied herein and depicted in FIG. **8**A, a perspective view of a power control device **110** in accordance with a third embodiment of the present invention is shown. In this embodiment, the self-aligning front cover member includes the dimmer switch front portion **106** and a switch element **300**. Of course, the light module **116** is disposed under the switch element **300**. Each of these elements (**106**, **300**, **116**) has a raised rectangular form factor that corresponds to a standard wall plate opening. Switch **300** also includes raised edges **302** that are configured to align with the raised edge of dimmer cover member **106** and light module **116**. Raised edges **302**, light module **116**, and dimmer cover member **106** are configured to be flush, or slightly raised, relative to the surface of the cover plate **150**.

Those of ordinary skill in the art will understand that control knob **104** may be coupled to either a continuously variable dimmer control or a variable speed fan control disposed in body member **120**. Thus, switch control **106** may also be implemented as a multi-positional switch, such as a three way switch. The three-way switch may be configured to switch between an OFF position, an intermediate position, and a full

ON position. The three way switch may be operatively coupled to the series pass element in the device and to a remote switch.

Switch **300** may be configured as a preset switch that is disposed in series with the variable speed dimmer or fan control. The preset switch provides device **100** with an ON/OFF control. The preset switch turns the dimmer ON at the last selected brightness level, or at a predetermined brightness level, eliminating the need for the user to find the desired setting every time the device is switched ON and OFF. This allows a user to keep control knob **104** in a desired position such that the user need only actuate switch **300** to cause device **100** to operate as it did during the last operation.

In another embodiment, switch **300** may be configured to provide ON/OFF control to a separate electrical load. Those skilled in the art understand that general purpose switches of this type that are typically employed in residential environments should be rated at either 15 Amperes or 20 Amperes, depending on the application. As shown, switch **300** toggles between positions disposed along the longitudinal axis of device **100**. The directionality of switch toggling is advantageous because it avoids interference with any switches that may be disposed nearby. Alternatively, switch **300** may be configured to toggle in the transverse direction.

Device **100** includes a user accessible trim adjuster **117**. Trim adjuster **117** is accessible to the user when the cover plate is removed. As noted previously, trim adjuster **117** provides a low end voltage adjustment that allows the user to set the minimum light intensity, or the minimum fan motor speed. Those of ordinary skill in the art will understand that certain electric motors tend to stall below a certain operating speed. Accordingly, trim adjuster **117** allows the user to calibrate device **100** to the fan motor. This feature may also be useful to adjust the minimum light intensity provided by the dimmer.

FIG. **8**B is a plan view of the power control device depicted in FIG. **8**A disposed in a standard wall plate **150**. Again, the frameless front cover assembly has a raised rectangular form factor that closely fits into the cover plate **150** opening. The self-aligning front cover member includes the dimmer switch front portion **106** and a switch element **300**. Each of these elements (**106**, **300**, **116**) has a raised rectangular form factor that corresponds to a standard wall plate opening. In other words, each of the aforementioned elements has a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening.

The gap between wall plate **150** and cover member **106** is slightly exaggerated in FIG. **8**B. The planar surface of member **106** and the raised portions **302** are flush with the exposed surface of the wall plate. Accordingly, the cover plate cannot interfere with the actuation of the control knob **104** or switch member **300**. Furthermore, there are no inaccessible crevices or recessed surfaces that inhibit cleaning. Again, the term "standard wall plate" is defined herein as a wall plate that conforms with the dimensions provided by the ANSI/NEMA WD6 standard.

As embodied herein and depicted in FIG. **9**, a schematic diagram for the power control device depicted in FIG. **8**A is shown. The schematic diagram of FIG. **9** is almost identical to the diagram shown in FIG. **3**. The exception is that a single-pole double-throw is included. In one embodiment, the single-pole double-throw switch is a control switch **128'**. Control switch **128'** is operatively coupled to adjustable element R**1**. The coupling is denoted by dotted line **127**. Terminals **102'** and **102"** are electrically connected to fixed contacts **136** and **138** (see FIG. **4**.) Also, terminals **102'** and **102"** are connected to like terminals in a remotely located switch. The two switches are interconnected to allow power to the load to be switched OFF and ON by either switch. This is commonly referred to as a three-way switching scheme. Light module **116** is coupled to switch **128'** so as to emit light whenever power is not being provided to the load.

In an alternate embodiment, the single-pole double-pole switch is the preset switch **300**. Of course, preset switch **300** and the adjustable element are independently operable, (dotted line **127** is omitted in this embodiment.)

The load is coupled to the source voltage by way of terminal **102** and one of terminals **102'**, **102"** which are selected by operation of preset switch **300** (SI). In contrast to a control switch, a preset switch is not coupled to adjustable element R**1**. Dashed line **304** illustrates the connection between the preset switch **300** and potentiometer **126**. Switch **300** is configured to turn the power control circuit **1600**N or OFF. Light module **116** functions as a locator light element. When preset switch **300** is OFF the light module **116** is energized. If preset switch **300** is ON, the circuit is energized and light module **116** does not emit light.

As embodied herein and depicted in FIG. **10**, a plan view of the heat sink **110** depicted in FIGS. **8-9** is shown. Like the heat sink member shown in FIG. **7**, all of the elements of heat sink **110** are disposed in a single plane. Heat sink **110** includes a central portion **122** that includes several apertures **124**, **126**, **128** that are formed to accommodate the control knob stem **1040**, switch **300**, and light module **1116**, respectively. An upset line **118** extends along each longitudinal side of heat sink **110** separating interior portion **122** from removable tabs **112**. Tabs **112** are segmented by forming linear gaps **114** extending between the longitudinal edges of the heat sink and upset lines **118**. Upsets **118** may be implemented using scored lines, perforations, notches, and/or similar features. Unlike conventional designs, there are no gaps along the longitudinal axis between heat sink **110** and tabs **112**. The innovation results in superior thermal conductivity between portion **122** and tabs **112**.

The segmented break-off tabs are easier to remove than a single tab disposed along the longitudinal edge of heat sink **110**. Further, the segmented tabs allow for the removal of a single tab in the event that it is necessary to only remove a single tab for proper device installation. Accordingly, the remaining tabs are left in place to provide optimal heat-sinking functionality.

It will be apparent to those of ordinary skill in the pertinent art that modifications and variations can be made to strap/heat sink **110** of the present invention depending on cost, manufacturability, and heat conduction characteristics. Accordingly, heat sink **110** may be fabricated using a conductive material such as aluminum or steel. The material may be plated, anodized, black anodized, or similarly processed.

Referring to FIG. **11**, a cross-sectional view of the device **100** depicted in FIG. **8**A is shown. The dimmer portion **106** disposed adjacent to the switch button **300** is a smaller version of the dimmer switch fully described above.

The preset switch **300** toggles between an ON position and an OFF position represented by raised surfaces **302**, **302'**. Raised surfaces **302**, **302'** are used to actuate the switch between the two positions. Those of ordinary skill in the art will understand that switch **300** may be implemented using any suitable form factor that provides the user with the ability to toggle between the two positions. For example, switch **300** may be in the shape of a lever (not shown) wherein the two tactile surfaces are disposed on opposite sides of the lever. Switch **300** may be a push button switch. In this embodiment, each depression of the push button toggles the switch from one position into the other.

Switch **300** includes an actuator arm **318** that extends into the interior of device **100**. A center bias spring **316** applies force to actuator arm **318** such that a snapping action occurs when switch **300** is toggled between the ON and OFF switch positions. Actuator arm **318** is also coupled to pivot member **320**. Pivot member **320** rotates in cradle member **322** under the guidance of actuator arm **318**.

Referring to FIG. **12**, a detail perspective view of the printed circuit board assembly employed in the embodiment of FIG. **8**A. FIG. **12** shows in pivot member **320** disposed in the cradle member **322**. Cradle member **322** is fastened to printed circuit board **132**. Cradle member **322** allows pivot member **320** to rotate the switch between the ON/OFF positions. Pivot member **320** and cradle member **322** are electrically conductive. The terminal **102** may be connected to the cradle by way of a printed circuit board trace.

The printed circuit board **132** also accommodates most of the other electrically active components in device **100** including potentiometer **126**, switch **128** (**128'**), the series pass element Q**1**, and electrical components coupled to the series pass element. Other electrical components mounted to the circuit board **132** include surface mount components disposed on one or both sides of printed circuit board **132**, and/or leaded (through hole) components.

FIG. **13** is a detail view of the paddle switch mechanism shown in FIG. **12** is disclosed. In particular, FIG. **13** shows the connectivity between pivot member **320** and the terminals **102**. While pivot **320** is disposed within the device body, the terminal members **102**, **102'** and/or pressure plates **105** are disposed on either side of device **100** and accessible to the user. Each of the terminals **102**, **102'** include arms **326**, **326'** that extend perpendicularly into the interior of device **100**. Each arm **326**, **326'** includes a fixed contact **328**, **328'** that is aligned with a movable contact **324**, **324'** disposed on pivot member **320**. Of course, contact **324** is hidden behind member **320** in the view provided by FIG. **13**. Pivot member **320** rotates between arm **326** and arm **326'** depending on which raised surface **302**, **302'** on switch **300** is depressed.

Electrical contacts (**324**, **328**) may not be necessary for pre-set switches since they are typically rated about 8 Amperes or less. Electrical connectivity between the common terminal and one or the other of the stationary terminals relies on contact between a surface of one or the other arm **326** and pivot member **322**. Such surfaces may be plated surfaces, e.g. plated silver surfaces.

Reference is also made to U.S. patent application Ser. No. 10/726,128 and U.S. patent application Ser. No. 11/058,865, which are incorporated herein by reference as though fully set forth in its entirety, for a detailed explanation of alternate switch subassembly embodiments.

As embodied herein and depicted in FIG. **14**, a perspective view of a fourth embodiment of the present invention is shown. Device **100** includes two independently operable control knobs **400**, **402**. Thus, power control device **100** may be employed to operate two dimmers, a fan speed control and a dimmer, a heating control and a dimmer, among other combinations. Device **100** may be equipped with two triacs thermally coupled to heat sink **110**.

As embodied herein and depicted in FIG. **15**, a perspective view of a fifth embodiment of the present invention is shown. In this embodiment, device **100** includes two sets of power controls. The first set includes adjustable control knob **500** and its corresponding preset switch **504**. The second combination includes control knob **501** and its corresponding preset switch **505**. In one embodiment, control knob **500** is configured as be actuated between multiple discrete positions. For example, control knob **500** may be moved between three fan speeds. Of course, those of ordinary skill in the art will understand that switch **500** may also be configured as a five speed control mechanism. Paddle switch **504** is a preset switch and is actuated between the ON and the OFF position. Control knob **501** may be employed as a control mechanism for a continuously variable dimmer switch. Corresponding paddle switch **505** is also a preset switch and turns the dimmer circuit ON/OFF. Those of ordinary skill in the art will understand that device **100** may be suitable for controlling two dimmers, a fan speed control and a dimmer, a heating control and a dimmer, or other such device combinations and pairings. In one embodiment, device **100** is equipped with two triacs thermally coupled to heat sink **110**.

In another embodiment of the present invention, paddle switches **504** and **505** are decoupled from control knobs **500** and **501**, respectively. Thus, device **100** may be configured to control two, three, or four individual electrical loads depending on whether the paddles switches (**504**, **505**) are placed in series with their corresponding variably adjustable switch (**500**, **501**). As used herein, the term "general purpose switch" is used to described a switch that is coupled to an electrical load that is not coupled to the power controller. A power control device may include one or more of general purpose switches, preset switches, or control switches. These switch types may also be employed in combination as required.

This embodiment is also equipped with either a light module, a removable light module, or a blank member, each designated as reference element **116** in the Figures. The raised form factor of module **116**, switches **504**, **505**, and switch cover **106** are configured to provide an alignment during cover plate installation in the manner previously described.

FIGS. **16-17** are detail views of the dual switch embodiment depicted in FIG. **15**. In this embodiment, there is only a single stationary terminal associated with each switch, i.e., both switches are on-off (single pole-single throw) switches. The switch is connected to a circuit during installation by way of wire leads **200** instead of by way of screw terminals. In an alternate embodiment (not shown) pivot members **320** are disposed within a single, unified cradle **322'**. The terminal connected to the unified cradle is common to the two switches. In an alternate embodiment, at least one of the switches is a three-way switch.

As embodied herein and depicted in FIG. **18**, a plan view of a sixth embodiment of the power control device of the present invention is shown. This embodiment is similar to previous embodiments, except that a receptacle outlet **700** is included in the lower portion of the device **100**. Receptacle outlet **700** is coupled to the source voltage. Receptacle outlet **700** includes electrical contacts configured to permit electrical engagement of a plug by a user that in turn provides power to a user attachable load. Switch **300** may be wired as a preset switch, a switch wired to an independent load, or as a switch in series with the receptacle outlet **700**. Lamp module **116** is included in device **100**. As mentioned above, module **116** may be configured as a pilot light, a locator light, a night light, or to perform any of the other previously described light module functions.

Referring to FIG. **19**, a plan view of a seventh embodiment of the power control device of the present invention is shown. This embodiment is similar to the embodiment shown in FIG. **18** except that switch **300** and lamp module **116** have been omitted and heat sink tabs **112** have been included.

It will be apparent to those skilled in the art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention. Thus, it is intended that the present invention cover

the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A device for adjustably providing power to at least one electrical load, the device comprising:

a body member;

a plurality of terminals configured to be coupled to a source of the power and at least one load;

a power control circuit disposed in the body member and coupled between the plurality of terminals and the at least one electrical load, the power control circuit including at least one variable control mechanism coupled to at least one series pass element, the at least one series pass element being configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting; and

a frameless front cover assembly connected to the body member and having a raised rectangular form factor substantially corresponding to a standard wall plate opening, the frameless front cover assembly comprising a plurality of switch mechanisms including at least one first switch mechanism coupled to the at least one variable control mechanism and at least one second switch mechanism actuatable without interference from the standard wall plate, the at least one first switch mechanism and the at least one second switch mechanism being characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening.

2. The device of claim **1**, wherein the at least one first switch mechanism includes at least one user variable slide switch assembly configured to adjust the variable control mechanism.

3. The device of claim **2**, wherein the at least one user variable slide switch assembly includes at least one control switch mechanism actuatable between an OPEN position and CLOSED position at a predetermined adjustment position of the at least one user variable slide switch.

4. The device of claim **3**, wherein the at least one control switch mechanism is either a single-pole single-throw switch or single-pole double-throw switch.

5. The device of claim **2**, wherein the user variable slide switch assembly includes a continuously variable switch.

6. The device of claim **2**, wherein the user variable slide switch assembly includes a multi-position switch.

7. The device of claim **2**, wherein the at least one user variable slide switch assembly is characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

8. The device of claim **2**, wherein the frameless front cover assembly further comprises a modular lamp assembly coupled to the user variable slide switch assembly, the at least one user variable slide switch assembly and the modular lamp assembly in combination being characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

9. The device of claim **1**, wherein the at least one second switch mechanism includes either a single-pole single-throw switch or single-pole double-throw switch.

10. The device of claim **1**, wherein the at least one second switch mechanism includes a preset switch coupled to the at least one first switch mechanism, the preset switch being configured to turn the at least one first switch mechanism between an ON state and an OFF state.

11. The device of claim **1**, wherein the at least one first switch mechanism and the at least one second switch mechanism in combination are characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

12. The device of claim **1**, wherein the frameless front cover assembly further comprises a modular lamp assembly coupled to the at least one first switch mechanism, the modular lamp assembly being disposed in longitudinal alignment with the at least one first switch mechanism and the at least one second switch mechanism, such that the at least one first switch mechanism, the at least one second switch mechanism and the modular lamp assembly in combination are characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

13. The device of claim **1**, wherein the at least one variable control mechanism includes a control circuit coupled to the series pass element, the control circuit being configured to cycle the series pass element between an ON position and an OFF position a predetermined number of times during each AC cycle in accordance with the at least one adjustable switching mechanism switch setting.

14. The device of claim **13**, wherein the control circuit includes an RFI noise suppression circuit.

15. The device of claim **12**, wherein the RFI noise suppression circuit includes at least one inductor and at least one capacitor.

16. The device of claim **1**, further comprising at least one surge suppression device.

17. The device of claim **1**, wherein the at least one series pass element includes a solid state device.

18. The device of claim **17**, wherein the solid state device includes a thyristor.

19. The device of claim **17**, wherein the solid state device includes a triac.

20. The device of claim **1**, wherein the at least one variable control mechanism includes a continuously variable potentiometer.

21. The device of claim **1**, wherein the at least one variable control mechanism includes a multiple position switch element configured to drive the series pass element between multiple discrete power settings.

22. The device of claim **21**, wherein the multiple position switch element is configured to switch between a plurality of capacitors when driving the series pass element between multiple discrete power settings.

23. The device of claim **1**, wherein the plurality of terminals include screw terminals.

24. The device of claim **1**, wherein the plurality of terminals include wire terminals.

25. The device of claim **1**, wherein the at least one variable control mechanism includes a plurality of switching mechanisms and the at least one series pass element includes a plurality of series pass elements.

26. The device of claim **1**, wherein the at least one second switch mechanism includes at least one preset switch coupled in series with the at least one series-pass element.

27. The device of claim **1**, wherein the at least one second switch mechanism includes at least one general purpose switch configured to control at least one load.

28. The device of claim **1**, wherein the at least one electrical load includes a fan motor.

29. The device of claim **1**, wherein the at least one electrical load includes a lamp.

30. The device of claim **1**, wherein the frameless front cover assembly further comprises either a modular lamp

assembly or an interchangeable blank member having a form factor substantially similar to the modular lamp assembly form factor.

31. The device of claim **30**, wherein the modular lamp assembly includes a locator light.

32. The device of claim **30**, wherein the modular lamp assembly includes a pilot light.

33. The device of claim **30**, wherein the modular lamp assembly includes a night light.

34. The device of claim **1**, further comprising a mounting member disposed between the frameless front cover assembly and the body member, the distance between a rear surface of the mounting member and a major surface of the rear body member is approximately 1.20 inches or less.

35. The device of claim **34**, wherein the mounting member is a planar heat sink.

36. The device of claim **35**, wherein the planar heat sink includes a central portion configured to accommodate the frameless front cover assembly and segmented tabs disposed on the periphery of the central portion.

37. The device of claim **1**, wherein the front cover assembly further comprises a receptacle.

38. A device for adjustably providing power to at least one electrical load, the device comprising:

a body member;

a plurality of terminals configured to be coupled to a source of the power and at least one load;

a power control circuit disposed in the body member and coupled between the plurality of terminals and the at least one electrical load, the power control circuit including at least one variable control mechanism coupled to at least one series pass element, the at least one series pass element being configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting;

a frameless front cover assembly connected to the body member, the frameless front cover assembly including at least one switch mechanism coupled to the at least one variable control mechanism, the frameless front cover assembly having a raised rectangular form factor substantially corresponding to a standard wall plate opening, the frameless front cover assembly being characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening; and

a modular lamp assembly disposed in longitudinal alignment with the frameless front cover assembly, the modular lamp assembly being dimensionally characterized by the transverse dimension, the modular lamp assembly and the frameless front cover assembly in combination being dimensionally characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

39. A device for adjustably providing power to at least one electrical load, the device comprising:

a body member;

a plurality of terminals configured to be coupled to a source of the power and at least one load;

a power control circuit disposed in the body member and coupled between the plurality of terminals and the at least one electrical load, the power control circuit including at least one variable control mechanism coupled to at least one series pass element, the at least one series pass element being configured to provide power to the at least one electrical load in accordance with the at least one variable control mechanism setting;

a frameless front cover assembly connected to the body member and having a raised rectangular form factor substantially corresponding to a standard wall plate opening, the frameless front cover assembly comprising a plurality of switch mechanisms including at least one first switch mechanism coupled to the at least one variable control mechanism and at least one second switch mechanism actuatable without interference from the standard wall plate, the at least one first switch mechanism and the at least one second switch mechanism being characterized by a transverse dimension substantially equal to the transverse dimension of the standard wall plate opening; and

a modular lamp assembly disposed in longitudinal alignment with the frameless front cover assembly, the modular lamp assembly being dimensionally characterized by the transverse dimension, the modular lamp assembly and the frameless front cover assembly in combination being dimensionally characterized by a longitudinal dimension substantially equal to the longitudinal dimension of the standard wall plate opening.

* * * * *